PB87-188397

Superfund Record of Decision (EPA Region 4)
Pioneer Sand Company, Warrington, Florida
September 1986

(U.S.) Environmental Protection Agency
Washington, DC

26 Sep 86

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EPA/ROD/R04-86/016
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EPA

Superfund Record of Decision:

Pioneer Sand, FL

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15. SUPPLEMENTARY NOTES

16. ABSTRACT

The Pioneer Sand site, owned by the Pioneer Sand Company (PSC), is an inactive 11-acre quarry located near Belleview, FL. A disposal permit was granted to PSC in 1974 which alllowed the disposal of inert materials including construction debris and shredded automobile strippings. Between 1974 and 1978, phenols and resin compounds were deposited from Newport Industries (currently Reichhold Chemical Company). Domestic and industrial wastes including metal plating sludges were also received from the Pensacola Naval Air Station. Approximately 75 percent of the site is an excavation pit, while the remaining 25 percent is a fill area consisting of the above-mentioned materials. In 1981 the Florida Department of Environmental Regulation did not renew the disposal permit and ordered the waste dumping practices to cease. Based on the RI results for PCB analysis of soils at the site, the EPA conducted an Immediate Removal Action in August 1986. All known areas of PCB concentrations greater than 50 ppm were removed. The primary contaminants of concern include: VOCs, organics, heavy metals, phenols, phthalates, and toluene.

The selected remedial action for the site includes: RCRA Subtitle D landfill closure; leachate collection, treatment, and onsite disposal; surface water treatment and onsite discharge; and cover system for sludge pond waste. The estimated capital cost is $462,025 with O&M costs of $45,000 for the first year, and $34,900 for years 2-30.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Record of Decision Pioneer Sand, FL Contaminated Media: soil, sw Key contaminants: VOCs, inorganics, heavy metals		

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RECORD OF DECISION
REMEDIAL ALTERNATIVE SELECTION

SITE

Pioneer Sand Company, Warrington, FL

DOCUMENTS REVIEWED

I am basing my decision primarily on the following documents describing site specific conditions and the analysis of effectiveness and cost of the remedial alternatives for the Pioneer Sand Site:

- Remedial Action Master Plan - Pioneer Sand Site
- Site Investigation - Pioneer Sand Site
- Feasibility Study, Volumes I and II - Pioneer Sand Site
- Agency for Toxic Substances and Disease Registry - Health Assessment - Pioneer Sand Site
- Agency for Toxic Substances and Disease Registry - Review of Additional Soil Samples - Pioneer Sand Site
- Department of the Interior -- Natural Resources Damage Assessment - Pioneer Sand Site

DESCRIPTION OF SELECTED REMEDY

- Proper landfill closure of fill and sludge pond areas under Subtitle D of RCRA and Chapter 17-7 of the Florida Administrative Code.
- Installation of an onsite leachate collection, treatment, and disposal system.
- Onsite treatment and disposal of sludge pond waters.
- Operation and Maintenance (O&M) activities will include:
    - maintenance of landfill cover;
    - maintenance of leachate collection system and sludge removals;
    - groundwater monitoring.

Additional O&M activities may be identified during the remedial design.

DECLARATIONS

Consistent with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), and the National Contingency Plan (40 CFR, Part 300), I have determined that the above description of the selected remedy for the Pioneer Sand Site is cost-effective and provides adequate protection of public health, welfare, and the environment. The State of Florida has been consulted and agrees with the approved remedy. These activities will be considered part of the approved action and eligible for Trust Fund monies should the responsible parties fail to undertake the design and implementation of the selected remedy.

I have also determined that the action being taken is appropriate when balanced against the availability of Trust Fund monies for use at other sites. In addition, the selected remedy is more cost-effective than other remedial actions, and is necessary to protect public health, welfare, and the environment. All off-site disposal shall be in compliance with the existing policies of EPA.

If additional remedial actions are determined to be necessary, a Record of Decision will be prepared for approval of the future remedial action.

SEP 26 1986
DATE

Jack E. Ravan
Regional Administrator

SECTION I
SITE LOCATION
AND
DESCRIPTION

The Pioneer Sand Site is located near the town of Belleview, approximately five miles northwest of the City of Pensacola in the extreme western portion of the Florida Panhandle. A Naval Air Base, Saufley Field, is located less than 1/2 mile northwest of the site. Perdido Bay is located approximately 2 miles southwest of the site (Figure 1, Location Map and Figure 2, Site Map). The site's approximate geographic coordinates are 30° 27' 30" north latitude and 87° 19' 45" west longitude.

The Pioneer Sand Company is an inactive sand mining facility. The area of concern is an inactive 11-acre quarry, owned by the company, into which shredded auto parts, construction debris, and various industrial sludges and resins have been deposited. Approximately 75% of the site is an excavation pit, while the remaining 25% of the site is a fill area consisting of the material mentioned above. The excavation pit extends to a maximum depth of about 30 feet. A surface impoundment and a quarry pond are located in the excavated area.

The aquifer of concern underlying the Pioneer Sand Site is the Sand-and-Gravel Aquifer. This resource provides the only potable groundwater available in the area. Results from the Remedial Investigation indicate, at this time, that no private wells near the site are contaminated; furthermore, additional protection is provided in that almost all of the residents in the vicinity of the Pioneer Sand Site are on a public water supply from a deep well located approximately one mile southeast of the site.

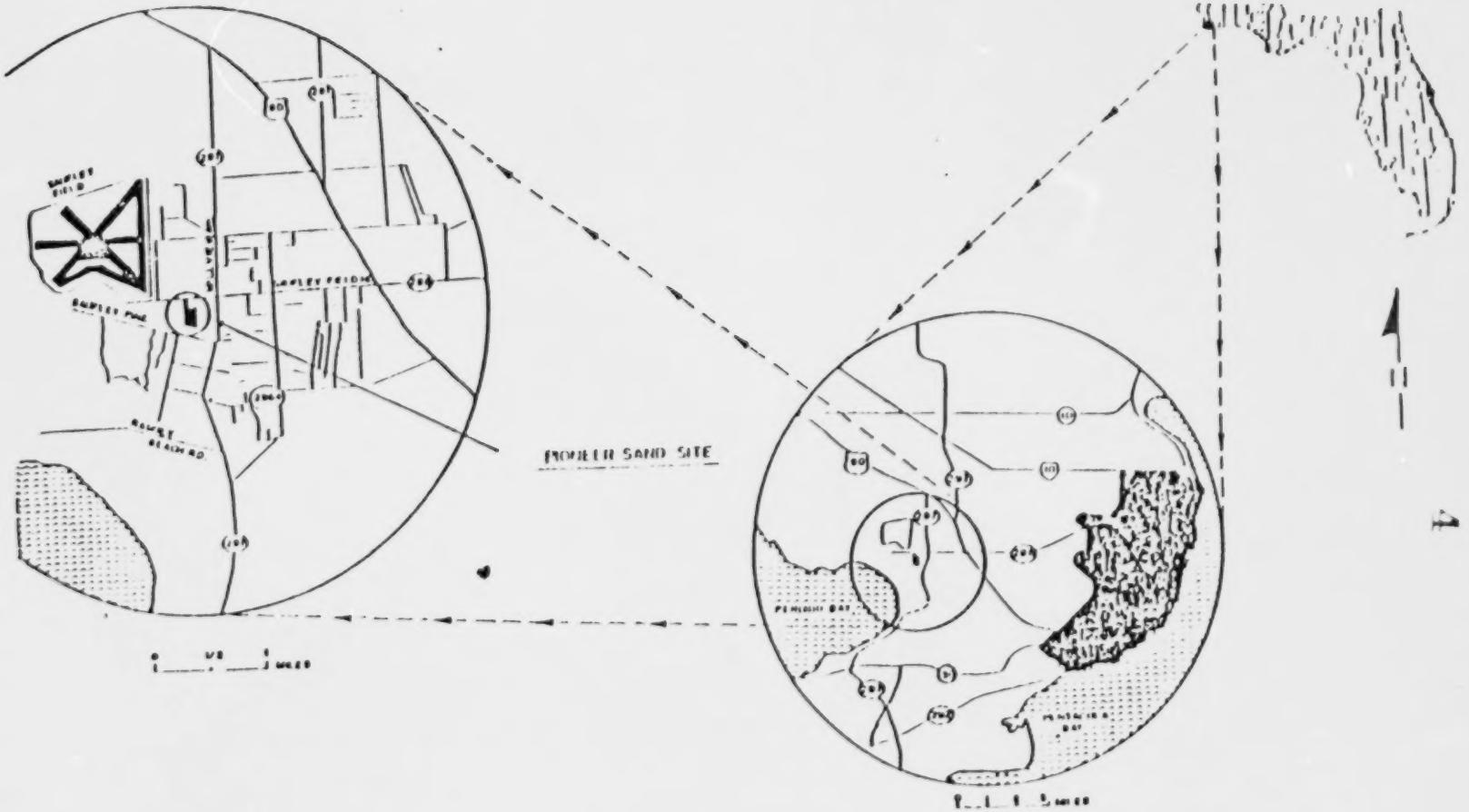


FIGURE 1: Site Location Map- Pensacola, Florida

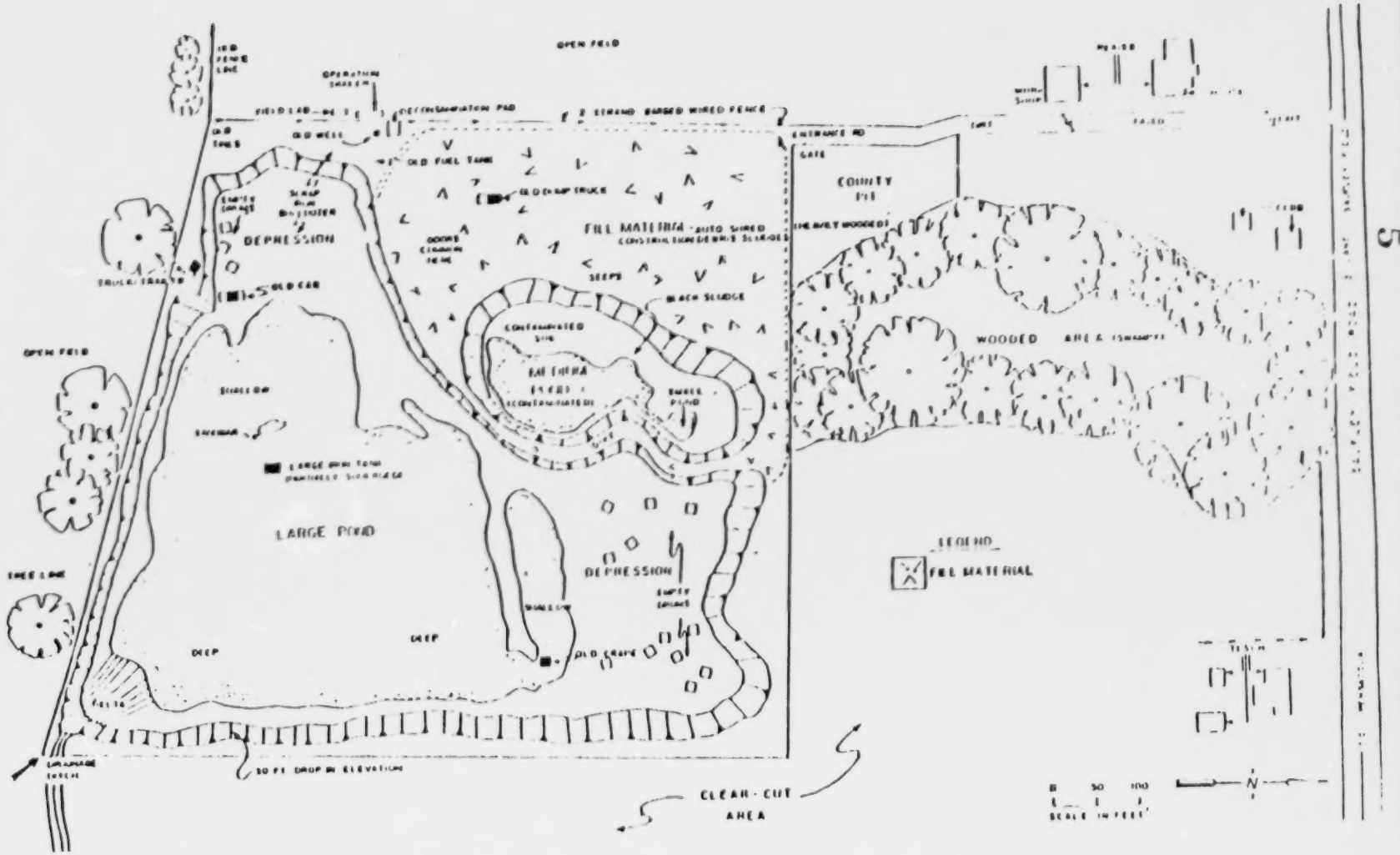


FIGURE 2: Site Map January 1985

SECTION II
SITE HISTORY

From the mid-1950's until 1978, the Pioneer Sand Pit was used as a borrow area for supplying sand to construct roads, buildings, etc. A Class III disposal permit was granted in 1974 which allowed the disposal of inert materials including construction debris and shredded automobile strippings. According to the files, during this period various types of phenols and resin compounds were deposited from Newport Industries (currently Reichhold Chemical Company). Domestic and industrial wastes including metal plating sludges were also received from the Pensacola Naval Air Station.

In 1981, the Florida Department of Environmental Regulation decided not to renew the disposal permit and ordered that the dumping of waste cease at the site. By this time, approximately one-fourth of the 11-acre pit had been backfilled to the original land surface with fill material.

In late 1981, a preliminary contamination survey was conducted to evaluate the extent of contamination at the site. Although elevated levels of various metals and organics were found, the sampling of private wells in the area showed no appreciable contamination when compared to the background water quality for the area.

Based on the Remedial Investigation (RI) results for PCB analysis of soils at the site, the EPA conducted an immediate removal of PCB contaminated "hotspots" at the site on August 6, 1986. All known areas of PCB concentrations greater than 50 ppm were removed.

SECTION III
CURRENT SITE STATUS

INVESTIGATION RESULTS

The Remedial Investigation (RI) consisted of collecting over 220 samples that were collected in various media on and offsite (Figures 3 and 4). Field screening techniques were used to guide in the selection of samples for Hazardous Substance List (HSL) scans. As a result of the field screening, 54 samples were analyzed for the 129 Priority Pollutants.

The RI was conducted in late 1984 and early 1985 and its main purpose was to assess: the types of contaminants present at the site; the lateral and vertical extent of contamination; the rate of movement of contaminants; contaminant pathways away from the source (fill material); and the potential impact upon the residents. The following general findings resulted from the Remedial Investigation.

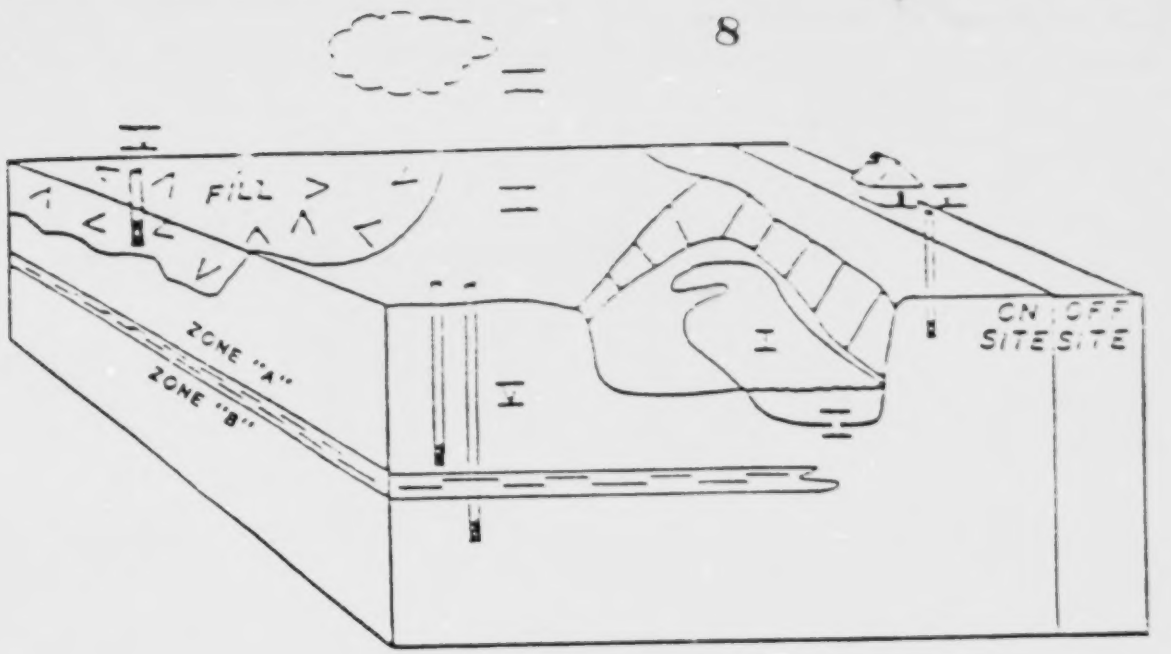
1) Within the fill material onsite, a wide variety of Priority Pollutant volatile and semi-volatile organic compounds and various Priority Pollutant metal concentrations were found in soil and water samples obtained from near surface and at shallow depths within the fill (Table 1).

2) The site is underlain by a shallow aquifer, 20-50 feet in depth, and a deeper sand aquifer from 80 to 250 feet in depth. Flow in the shallow aquifer is toward the south at approximately one to two feet per day. Flow in the deeper aquifer is toward the west at less than one foot per day (Figures 5, 6, 7, and 8).

3) One well installed through the fill material (8A) and completed beneath the fill in a semi-permeable confining bed, had concentrations of metals and organics well in excess of drinking water standards. Additionally, a leachate sample obtained from a fill material seep contained lead in concentrations exceeding the primary drinking water standard; cadmium in concentrations approaching the primary drinking water standard; and phenol, ethyl benzene, and toluene in concentrations exceeding 100 ppb. This sample represents leachate that is migrating into the sludge pond area (Tables 2 and 3).

4) None of the monitor wells (7 shallow, 4 deep) around the perimeter of the site had any indication of contamination attributed to the disposal activities of the Pioneer Sand Site.

5) Fifteen nearby private wells were screened for volatile organics and seven were selected for complete Priority Pollutant analyses. No contamination was found in any of the nearby private wells. Additional protection is provided in that almost all of the residents in the vicinity of the Pioneer Sand Site are on a public water supply drawing from a deep well located approximately one mile southeast of the site.



	SAMPLE TYPE	ID	SAMPLES COLLECTED	SAMPLES SCREENED(GC/F)[1] OFF-SITE	SAMPLES SCREENED(GC/F)[1] ON-SITE	PRIORITY POLLUTANT ANALYSIS	EP TOXICITY FOR METALS
I	Pond Water	PDW	8	N/A	8	5	N/A
II	Pond Sediment	PS	7	N/A	7	3	2
III	Surface Soil	SB	33	10	23	18	3
IV	Subsurface Soil/ Waste	SS/WB	161	29	18	7/6	2
V	Monitoring Wells	MW	17	12	5	17	N/A
VI	Private Wells	PW	15	15	N/A	7	N/A
VII	Air	AS	6	N/A	N/A	6[2]	N/A

[1]Field Gas Chromatograph and Fluorospectrograph

[2]Scan - PCB's, metals, particulates, organic volatiles

FIGURE 3: Sampling Activities

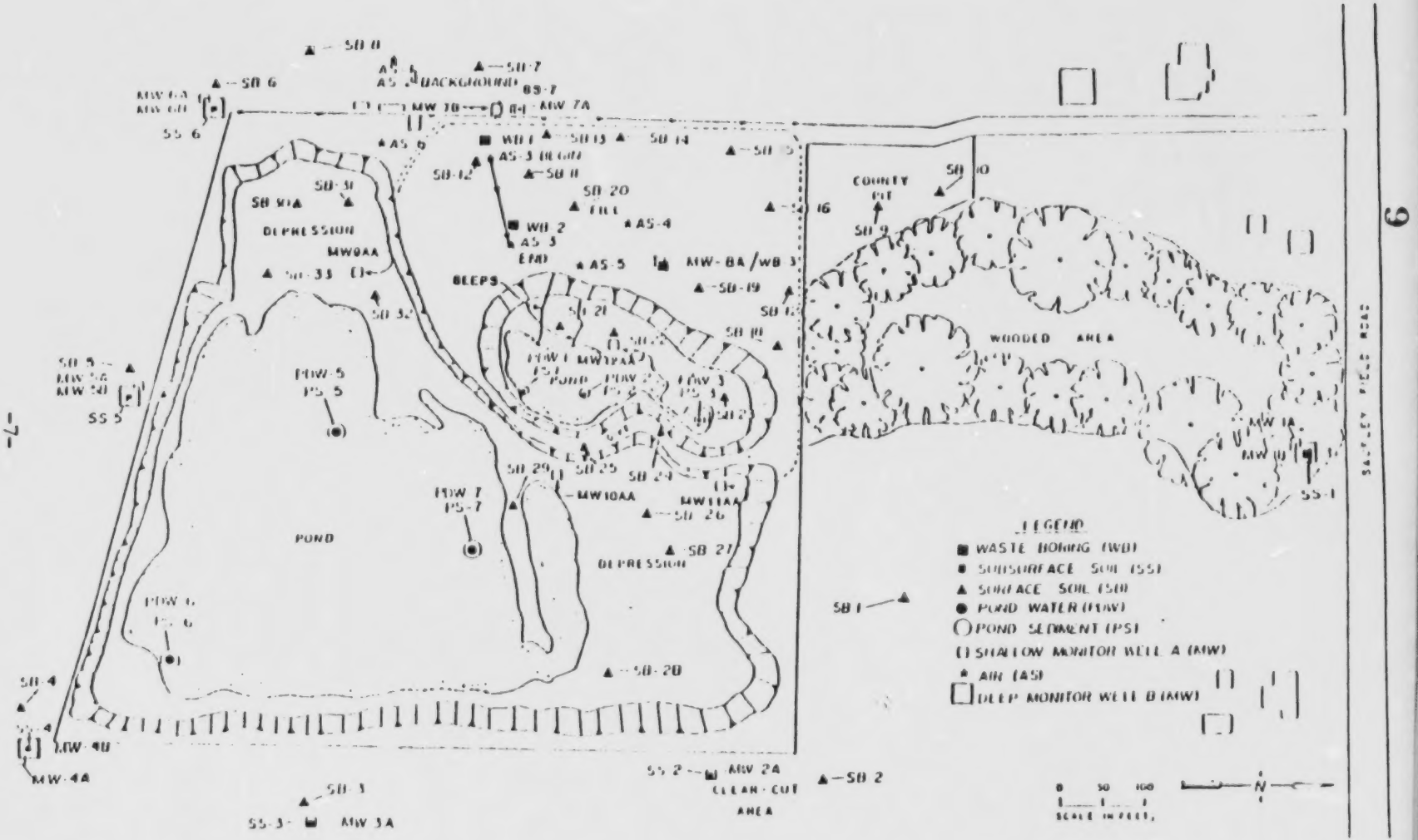


FIGURE 4: Sampling Location Map

Table 1. Onsite Contaminant Profile.

Media	Contaminant	Highest Concntration in Medium	Ambient Concentration of Contaminant
		(mg/kg)	(mg/kg)
Sludge	Cadmium	13.2	1
"	Copper	942	14
"	Chromium	106	36
"	Lead	217	14
"	Nickel	60.7	13
"	Zinc	7479	36
"	2,4 Dichlorophenol	2.52	0
"	Phenol	6.55	0
Onsite Surface Soil	Cadmium	94.1	1
"	Copper	25,851	14
"	Chromium	201	36
"	Lead	4,380	14
"	Nickel	475	13
"	Thallium	53.7	0
"	Zinc	16,025	36
"	Benzo (a) Anthracene	1.2	0
"	Benzo (b) fluorathene	1.7	0
"	Benzo (k) fluoranthene	1.3	0
"	Benzo (a) pyrene	1.9	0
"	Benzo (ghi) perylene	1.5	0
"	Benzidine	1.0	0
"	Bis (2-ethylhexyl) phthalate	72.9	0
"	Butylbenzylphthalate	43.3	0
"	Chrysene	0.9	0
"	Di-n-butylphthalate	52	0
"	2,4-Dinitrotoluene	1.9	0
"	Dioctylphthalate	2.6	0
"	Fluoranthene	3.1	0
"	Indeno (1,2,3-cd) pyrene	2.4	0
"	Pyrene	3.7	0
"	Phenol	1.5	0
"	Chloroform	1.3	0
"	1,1 Dichloroethene	0.1	0
"	Methylene chloride	0.8	0
"	Benzene	0.2	0
"	Ethylbenzene	1.8	0
"	Toluene	1.1	0
"	Xylenes	0.6	0
"	Arochlor 1242	410	0
"	Arochlor 1248	51	0
"	Arochlor 1254	19	0

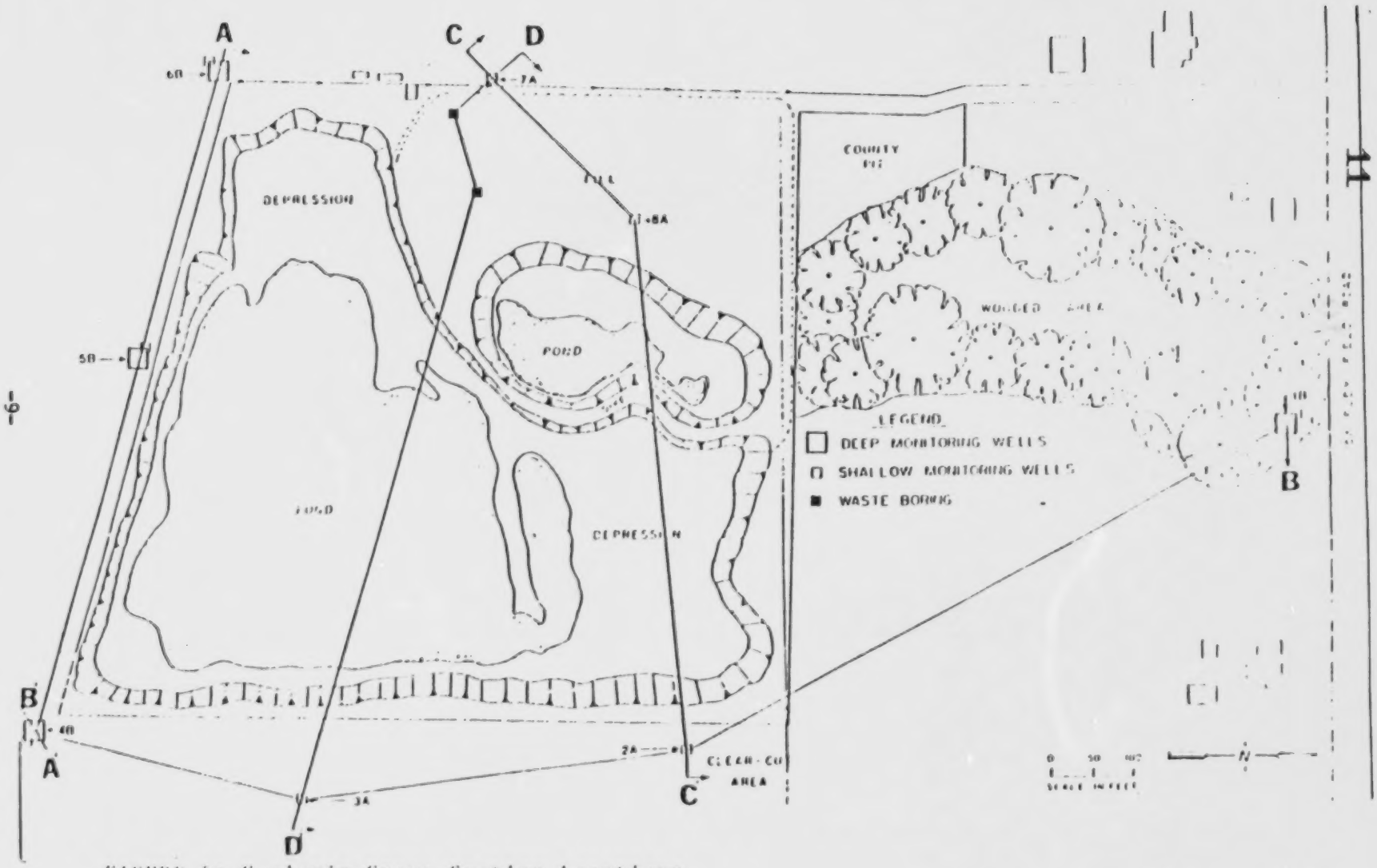


FIGURE 5: Geologic Cross-Section Locations

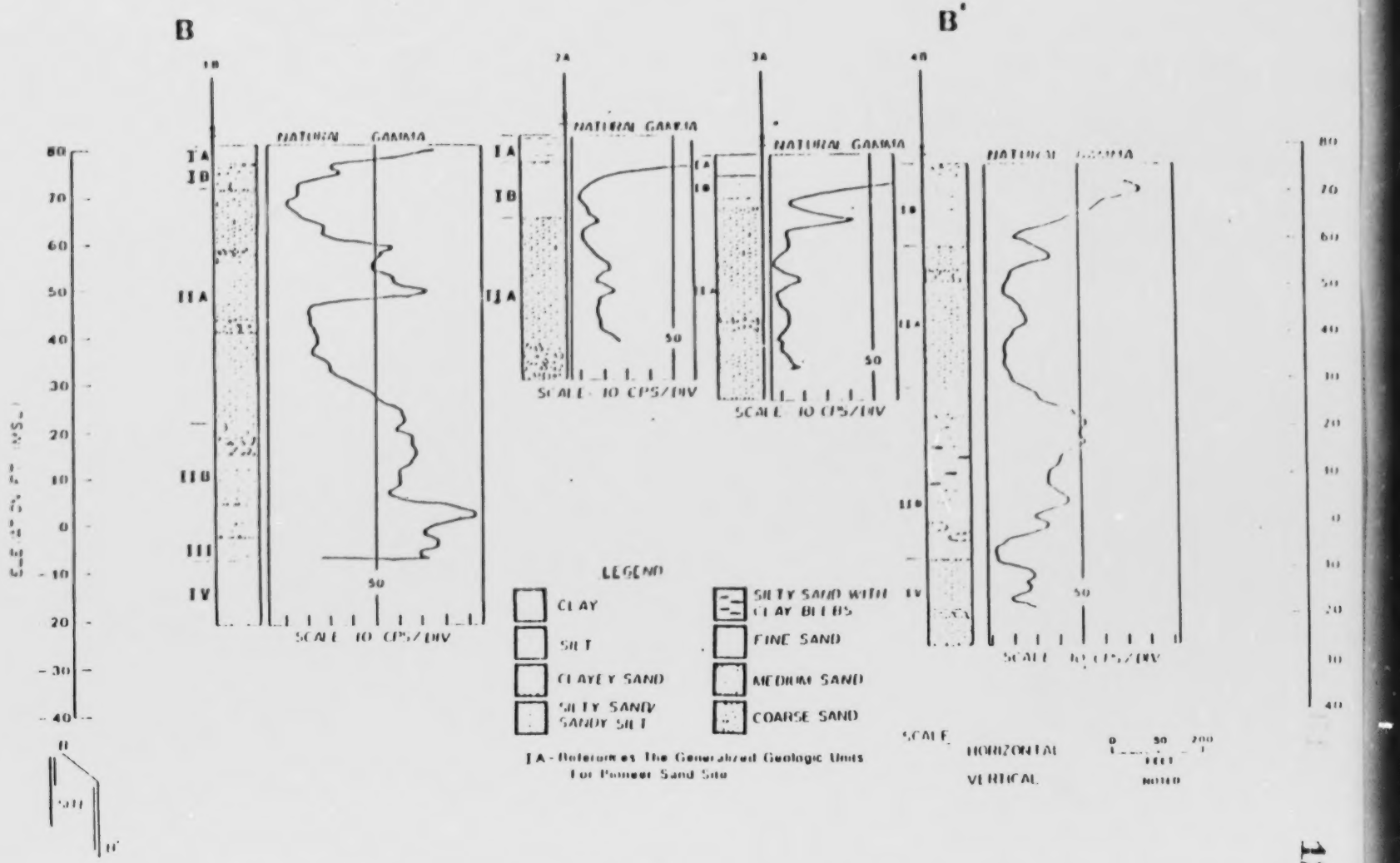


FIGURE 6: Generalized Geologic Cross-Section

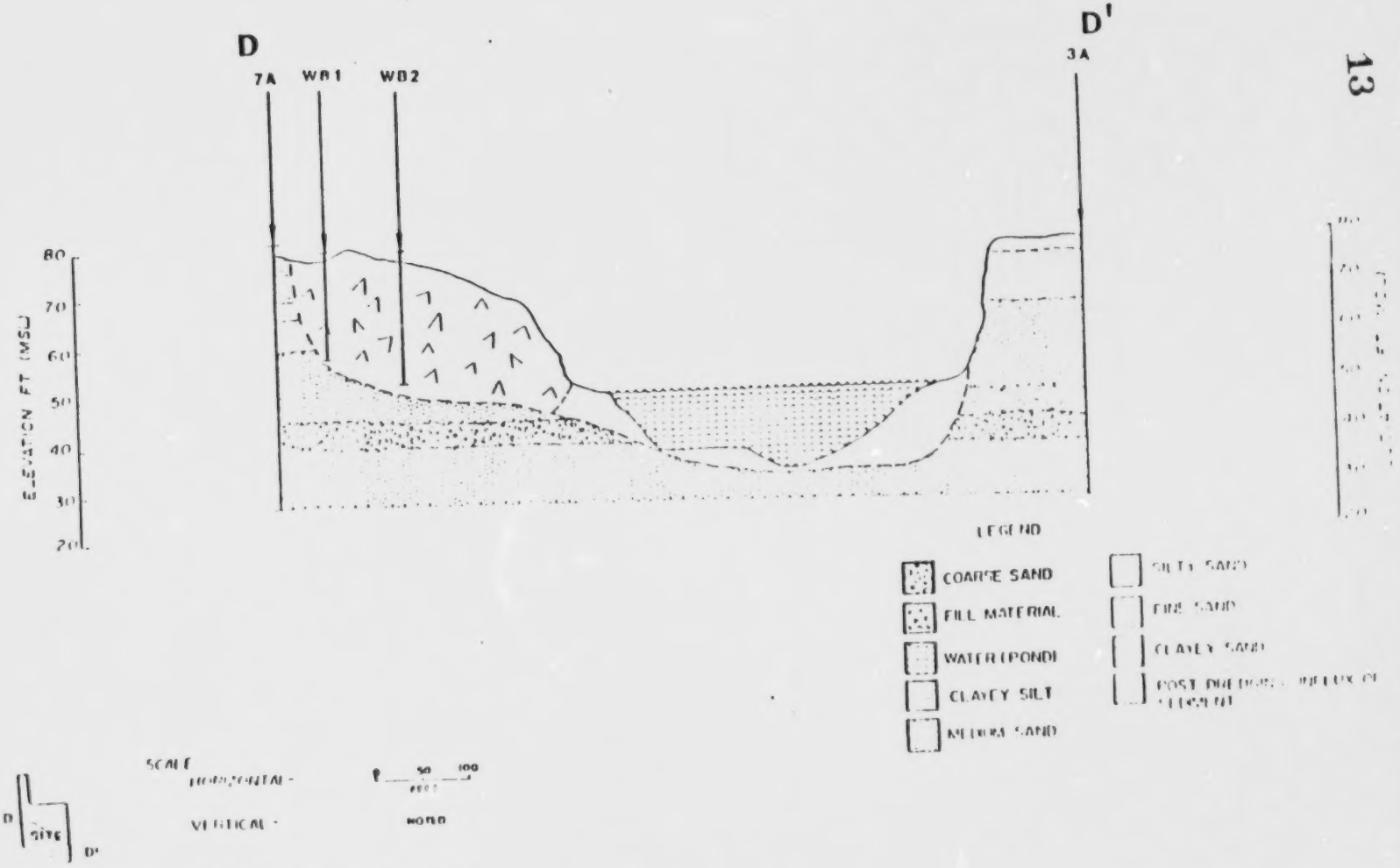


FIGURE 7: Topographic Profile

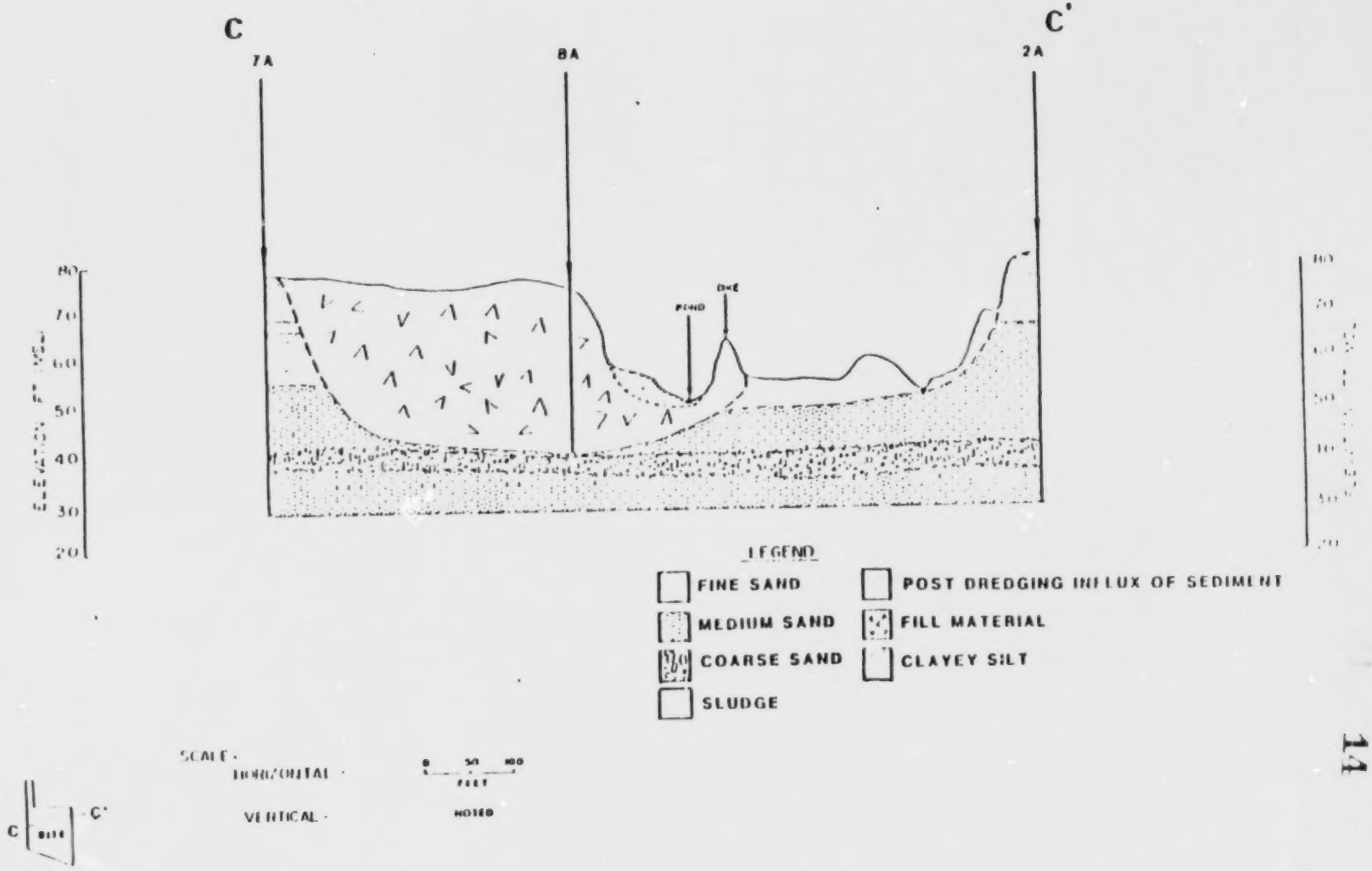


FIGURE 3: Topographic Profile

Table 2. Concentration of Organic Contaminants in Leachate.

Class	Organic Contaminant	Concentration in Leachate (ug/l)
Volatile Organic Compounds	Chlorobenzene	67.6
	1,2 Dichlorobenzene	21.5
	1,3 Dichlorobenzene	24.6
	1,4 Dichlorobenzene	32.8
	Tetrachloroethane	1.7
	Benzene	6.7
	Ethyl benzene	269.0
	Toluene	4000.0
	Xylenes	959.0
Phenolics	2,4 Dimethylphenol	122.0
	Pentachlorophenol	136.0
Phthalates	Bis (2-ethylhexyl) phthalate	61.3
	Butyl benzyl phthalate	7.25
	Dioctylphthalate	Trace

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Phthalates	Bis (2-ethylhexyl) phthalate	61.3
	Butyl benzyl phthalate	7.25
	Dioctylphthalate	Trace

Table 3. Concentration of Inorganic Contaminants in Leachate. **16**

Metal	Symbol	Water Quality Criteria (WQC)	Concentration in Leachate
		(mg/l)	(mg/l)
Cadmium	Cd	0.010	0.065
Chromium	Cr	0.050	0.391
Copper	Cu	1.00	0.210
Lead	Pb	0.050	2.24
Mercury	Hg	0.002	0.0002
Nickel	Ni	0.010	0.26
Thallium	Tl	-	0
Zinc	Zn	5.00	33.6

6) Extraction Procedure Toxicity analysis of fill material samples revealed the presence of cadmium and lead. In one sample, the cadmium (0.63 mg/l) and lead (4.11 mg/l) concentrations found in the fill material approached, but did not exceed, the concentrations which would designate the fill material as a hazardous waste (1.0 mg/l and 5.0 mg/l) respectively (Table 4).

In summary, extensive investigations conducted at the Pioneer Sand Site (chemical, hydrological, and geological) confirm that the contaminants dumped at the Pioneer Sand Site from 1973 to 1979 have not migrated off the site. Factors favoring the immobility of contaminants include: 1) the clay spoils covering the contaminants which greatly limit the amount of flushing of chemicals into the groundwater; 2) relative low permeability of the fill material which acts as a deterent to lateral groundwater flow. There is evidence that groundwater inflow towards the site is deflected around the fill material rather than migrating through the site; 3) lack of surface drainage features away from the site, i.e., lack of chemical transport via streams away from the site; and 4) the high volatility of the more mobile organic compounds which tend to "volatilize" in extremely short distances.

TABLE 4: FILL MATERIAL AND SLUDGE ANALYSIS FOR EXTRACTION PROCEDURE METALS (mg/l

PARAMETER	EP TOX STANDARD	FILL MATERIAL SAMPLES					SLUDGE SAMPLES	
		SB 18	WB 2	SB 23	WB 3	SB 11	PS 1	PS 2
Arsenic	5.0	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	100.0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Cadmium	1.0	0.628	0.012	0.008	0.009	0.039	0.009	0.009
Chromium	5.0	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Lead	5.0	4.11	0.19	0.15	0.13	0.29	0.16	0.18
Mercury	0.2	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Selenium	1.0	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Silver	5.0	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

SECTION IV
ENFORCEMENT ANALYSIS

The Pioneer Sand Site received waste from several sources during its years of operation. The Naval Air Station in Pensacola, Florida, has been identified as the source of the RCRA hazardous waste found at the Site. On or about August 4, 1977, the owner and operator of the facility, Mr. Walter Dugger, was awarded a contract by the U.S. Navy to clean the domestic and industrial waste water treatment sludge drying beds at NAS Pensacola and at the outlying landing field at Saufley, Florida. This sludge was dumped at the Pioneer Sand Site. Other wastes at the Site were received from Reichhold Chemicals, Inc., and Auto-Shred. Mr. Dugger signed a consent judgment with the Florida Department of Environmental Regulation (FDER) in March, 1983. The judgment states that the owner, Mr. Dugger, agrees to help with "all testing and cleanup activities at the site" in any way he can and, upon the completion of the remedial activities, the Site will be sold and the proceeds used to pay for the cleanup. However, it will be several years before the Site can be sold. Meanwhile, the EPA has the enforcement lead for cost reimbursement.

During 1983 and 1984 the EPA negotiated with the Navy and Reichhold, potentially responsible parties (PRPs), regarding PRP conduct of the remedial investigation and feasibility study (RI/FS). The parties were unable to reach agreement and in March 1984, EPA proceeded with a Cooperative Agreement with the Florida Department of Environmental Regulation for the RI/FS at the Site. Recently the Navy has indicated it would agree to participate in the remedial activities. Reichhold has also expressed interest in resuming negotiations for participation in the remedial design/remedial action (RD/RA). In 1983 and 1984 the Region took the position that AutoShred's waste was not a hazardous substance under Section 101(14) of CERCLA. At the present time, Auto-Shred is not considered a PRP. Both the Navy and Reichhold have, in the past, felt that PRP participation should include Auto-Shred. At the time of the finalization of the Record-of-Decision, the Navy and Reichhold will be offered the opportunity to participate in the RD/RA. It would be to the benefit of both the Navy and Reichhold to participate in the RD/RA at this particular site in that the present value cost of these activities is significantly less than one (1) million dollars and the remedy of choice is rather easily implemented.

SECTION V
ALTERNATIVES EVALUATION

ALTERNATIVE DEVELOPMENT

The National Contingency Plan (40 CFR 300.68) specifies that remedial alternatives should be classified as either management of migration (off-site migration) or source control.

Management of migration remedial action as specified in 40 CFR 300.68(e)(3) is necessary where hazardous substances have migrated from the original source of contamination and pose a significant threat to public health, welfare or the environment. Management of migration remedial actions has been eliminated from the feasibility study because the Remedial Investigation concluded that the contaminants dumped at the Pioneer Sand Site have remained in place and do not pose an immediate danger to human health, welfare or the environment.

Source controls as defined in 40 CFR 300.68(e)(2) address situations in which "a substantial concentration of hazardous substances remain at or near the area where they were originally located and inadequate barriers exist to retard migration of substances into the environment." Source control remedial actions may include alternatives to contain the hazardous substances in place or eliminate potential contamination by transporting the hazardous substances to a new location. Based on the above definition, the purpose of source control remedial actions is to prevent or minimize the migration of hazardous substances from the Pioneer Sand Site. In order to facilitate the development of alternatives, the technologies are arranged by target area and control measure and presented in Table 5. From the above list of technically feasible remedial action technologies, 15 specific alternatives were developed for the Pioneer Sand Site. These alternatives are presented and described in Table 6.

In addition to the above requirements for the development of alternatives based on technical feasibility, the U.S. EPA Guidance on Feasibility Studies under CERCLA (June 1985) states: "At least one alternative for each of the following must, at a minimum, be evaluated within the requirements of the feasibility study guidance and presented to the decisionmaker:

(a) Alternatives for treatment or disposal at an offsite facility approved by EPA (including RCRA, TSCA, CWA, CAA, MPRSA, and SDWA approved facilities), as appropriate;

(b) Alternatives which attain applicable and relevant Federal public health or environmental standards;

(c) As appropriate, alternatives which exceed applicable and relevant public health or environmental standards;

Table 5. Technology Screening, Remedial Action Technologies.

Fill Area

1. No action
2. No action with monitoring
3. Capping
4. Complete removal for offsite disposal

Leachate Control

1. No action
2. No action with monitoring
3. Collection and temporary storage for offsite disposal
4. Collection and temporary storage for onsite treatment and disposal
5. In situ treatment (permeable treatment beds)

Sludge Pond/Surface Water

1. No action
2. No action with monitoring
3. Onsite treatment (filtration) and discharge

Sludge Pond Sediments/Sludges

1. No action
2. No action with monitoring
3. Complete removal for offsite disposal
4. Complete removal for onsite disposal (RCRA Cell)

TABLE 6

FEASIBLE REMEDIAL ACTION ALTERNATIVES
PIONEER SAND SITE
PENSACOLA, FLORIDA

	FILL MATERIAL AREA		SLUDGE POND AREA		
Alternative	Soils/Wastes	Leachate	Surface Water	Sediment/Sludges	EPA Category
1	No action	No action	No action	No action	E
2	No action with monitoring	No action with monitoring	No action with monitoring	No action with monitoring	E
3	Cover system	No action	No action	No action	D
4	Cover system	Collection;temporary storage;disposal off-site	No action	No action	A,
5	Cover system	Collection;temporary storage;disposal off-site	On-Site Treatment; discharge	No action	D
6	Cover system	Collection;temporary storage;disposal off-site	On-site treatment; discharge	Fill;cover system	A,B
7	Cover system	Collection;temporary storage; disposal off-site	On-site treatment; discharge	Remove;dispose off-site	A,C
8	Cover system	Collection;temporary storage;disposal off-site	On-site treatment; discharge	Remove;dispose on-site	A,C
9	Cover system	Collection;temporary storage;dispose on-site	On-site treatment; discharge	Fill;cover system	B
10	Cover system	Collection;temporary storage;dispose on-site	On-site treatment; discharge	Remove;dispose off-site	A,C

TABLE 6
FEASIBLE REMEDIAL ACTION ALTERNATIVES
PIONEER SAND SITE
PENSACOLA, FLORIDA

	FILL MATERIAL AREA		SLUDGE POND AREA		
Alternative	Soils/Wastes	Leachate	Surface Water	Sediment/Sludges	EPA Category
11	Cover system	Collection;treatment; dispose on-site	On-site treatment; discharge	Remove;dispose on-site	C
12	Cover system	In situ treatment	On-site treatment; discharge	Fill;cover system	B
13	Cover system	In situ treatment	On-site treatment; discharge	Remove;dispose off-site	A,C
14	Cover system	In situ treatment	On-site treatment; discharge	Remove;dispose off-site	C
15	Remove;dispose off-site	No action	On-site treatment; discharge	Remove;dispose off-site	A,C

(d) Alternatives which do not attain applicable or relevant public health or environmental standards but will reduce the likelihood of present or future threat from the hazardous substances. This must include an alternative which closely approaches the level of protection provided by the applicable or relevant standards and meets CERCLA's objective of adequately protecting public health, welfare and environment.

(e) A no-action alternative."

Alternative 15, Complete Removal of Waste Material with Offsite Disposal, was eliminated. This alternative included disposal in a RCRA landfill or disposal in a newly contructed hazardous waste landfill adjacent to the site. Total present worth for disposal at a RCRA landfill and the adjacent landfill were $31.2 million and $16.6 million, respectively. The public health and environmental benefit realized with this technology did not offset its high cost. All other alternatives were retained for further development and evaluation.

ALTERNATIVE SCREENING PROCESS

The purpose of the initial screening process is to identify, develop, and incorporate complementary mitigating technologies into site specific alternatives. The National Oil and Hazardous Substances Contingency Plan (NCP Section 300.68(g)(h)) outlines the process for developing and screening remedial alternatives. The NCP states "a limited number of alternatives should be developed for either source control or offsite remedial action (or both) depending upon the type of response that has been identified." Furthermore, "the alternatives developed under CFR 300.68(g), Development of Alternatives, will be subjected to an initial screening to narrow the list of potential remedial actions for further detailed analysis." Three broad criteria should be used in the initial screening of alternatives: 1) cost 2) effects of the alternatives; and 3) acceptable engineering practice. In accordance with CFR 300.68(g) and (h) and U.S. EPA Guidance on Feasibility Studies Under CERCLA the initial screening process of remedial action technologies was divided into 6 steps:

- Identification of Remedial Action Technologies based upon General Response Actions,
- Development of Technological Feasibility Criteria and Screening (acceptable engineering practice),
- Development of Remedial Action Alternatives,
- Development of Environmental and Public Health Criteria and Screening,
- Other Criteria Screening, and
- Cost Estimating and Screening.

The technologies/alternatives remaining after the initial screening process were subjected to a detailed evaluation.

ALTERNATIVE TECHNOLOGIES

Several alternative technologies were studied for possible utilization as a remedy. The technologies considered were: incineration, solidification/ stabilization, biological treatment, chemical treatment, physical treatment, and in-situ treatment.

Incineration was eliminated from consideration because the wastes at the site contain low levels of organics making incineration an inappropriate technology.

Four alternatives were identified for the solidification/stabilization technologies. Cementation and pozzolanic cementation were retained for consideration, but were later eliminated due to the non-homogeneousness of the fill. The fill contains construction and demolition debris and large pieces of metal that would interfer with the solidification process. Thermoplastic binding and organic polymer binding were eliminated because of low performance.

Activated sludge, trickling filter, anaerobic digestion, extended aeration, and stabilization ponds were the biological treatment technologies considered. The biological technologies were eliminated for three reasons: insufficient organic concentration in the waste stream, some heavy metals may be toxic to treatment bacteria, and the influent flow is too low to maintain the treatment process.

The five chemical treatment methods that were considered are: neutralization, precipitation, reduction, wet oxidation, and chlorination. Precipitation was retained as a feasible technology. The four remaining technologies were eliminated due to the nature of the waste stream.

Physical treatment technologies considered included the following unit processes: reverse osmosis, ion exchange, carbon adsorption, stripping, sedimentation, dissolved air floatation, or filtration. Stripping, filtration, and sedimentation were considered technically feasible and retained. The remaining technologies were eliminated due to their undemonstrated performance and the nature of the waste stream.

The in-situ treatment technologies considered included: permeable treatment beds, physical chemical treatment, vitrification, solution mining, and biodegradation. Permeable treatment bed technology was retained for further consideration, but was eliminated in later evaluations due to inadequate removal efficiencies and the inability to insure the effectiveness of the system. The remaining four technologies were eliminated because of their lack of demonstrated reliability and performance and for the potential for groundwater contamination.

SUMMARY OF ALTERNATIVES EVALUATIONS

Fifteen remedial alternatives were initially screened with the intent to reduce the number of alternatives to be evaluated in detail. This initial screening process involved the use of four criteria: 1) technical feasibility; 2) public health effects; 3) environmental effects; and 4) cost. Of the fifteen alternatives, only one was eliminated from further evaluation.

Alternative 15 was eliminated because of its extremely high cost and its failure to significantly improve site conditions over several less expensive alternatives.

The remaining fourteen alternatives were evaluated in greater detail and underwent a detailed evaluation process. This process included evaluations for the following criteria in the following order: 1) technical feasibility (Table 7); 2) public health; 3) environmental (Table 8); 4) institutional; and 5) cost.

The first four criteria are listed in order of their priority, that is, technical feasibility has the highest priority and institutional has the lowest priority. Alternatives not passing a particular evaluation criteria were eliminated and not evaluated for subsequent, lesser priority criteria. Those alternatives passing criteria 1-4 underwent the final process, cost evaluation. Table 9 provides a description of the fifteen alternatives and lists the screening results and evaluation sequence from left to right. Alternatives passing all evaluation phases are listed in the second column from the right.

After the initial screening and elimination of Alternative 15, the alternatives were evaluated for technical feasibility. Alternatives 12, 13, and 14 were eliminated from further evaluation for two major reasons: first, the permeable treatment bed did not achieve adequate removal efficiencies for metals and organics; and second, there was no mechanism to ensure adequate treatment of the leachate.

Public health evaluation eliminated Alternatives 1-5, but Alternatives 2 and 4 were retained to fulfill EPA requirements.

The No Action or Alternative 1 is unacceptable from a public health standpoint because it does not alleviate any of the public health effects identified. Factors that justify the elimination of the No Action Alternative are based on the following potential long-term public health effects that have been identified if no remedial action is taken:

- Ingestion of contaminated groundwater, of particular concern are VOC, metals, and phenolics contamination;
- Direct contact with sludges containing metals and PCBs in the highest concentrations;
- Direct contact with fill area and sludge pond area soils contaminated with metals, phthalates, PAH, phenolics, VOCs, and PCBs.
- Inhalation of VOCs in low lying areas of the site.

Alternatives 8 and 11 were eliminated in the institutional evaluation, but also retained to fulfill EPA requirements. However, Alternative 8 was permanently dropped after the cost evaluation since Alternative 11 fulfilled the specific EPA category designation at less expense. None of the remaining alternatives were eliminated in the environmental evaluation phase. Alternatives 7 and 10 were eliminated in the cost evaluation, but Alternative 10 was retained to fulfill the EPA requirements.

TABLE 7: SUMMARY OF TECHNICAL FEASIBILITY

		PERFORMANCE		RELIABILITY		CONSTRUCTIBILITY		TIME		SAFETY	ENVIRONMENT
ALTERNATIVE	REMEDIAL ACTION	EFFECTIVENESS	USEFUL LIFE	O&M REQUIREMENTS	POSSIBLE FAILURE MODE	SITE CONDITION	CONSTRUCTION EXPERIENCE	IMPLEMENT	ACHIEVE	IMPACTS TO PUBLIC & SAFETY	
1	No Action	Does not contain, remove, or treat waste.	Not applicable.	Extremely low, periodic site inspection.	Fence does not provide adequate barrier against site entry and exposure.	Some site cleaning required to build fence.		1 month		May require respiratory protection (fence will be constructed in "clean area").	Long term potential for contamination or exposure still exists.
2	No Action With Monitoring	Does not contain, remove, or treat waste.	Not applicable.	Governmental unit must accept responsibility for monitoring. Periodically clean monitoring well.	No technology. Standard laboratory procedures.	Protect against tampering.		1 month monitoring program. Sample collection: 1st year-quarterly 2nd year on-semi-annually		Respiratory protector may be required.	
3	Fill Area Cover System	Contains fill material wastes; cover system limits exposure of fill material waste and reduces infiltration thereby reducing or eliminating infiltration. Efficiency is estimated to be greater than 80%.	Cover system will have an estimated useful life of >30 years if properly designed and maintained.	O&M requirements low. No complex maintenance is required. Materials and labor available locally: (1) mowing; and (2) repair of cover due. Settlement and erosion.	Inadequate design of the slope and drainage system will increase erosion of the cover and cause infiltration. May be required to excavate. Construction debris.	After grading the site for the proper slope, an additional layer of material may be required before placement of clay layer. Installation of cover will require approximately 25% longer due to safety requirements. Excavation of fill area may require substantially longer time due to obstructions.	Remedial actions are exempt from RCRA regulations and therefore do not require permits. Notification of activity to the appropriate authority is desirable.	3-5 months	1-2 months after completion of the cover.	Level B protection will be required during the excavation phase.	Sludges in pond area still exposed.

TABLE 7

ALTERNATIVE	REMEDIAL ACTION	PERFORMANCE: EFFECTIVENESS	PERFORMANCE: USEFUL LIFE	RELIABILITY: O&M REQUIREMENTS	RELIABILITY: POSSIBLE FAILURE MODE	CONSTRUCTABILITY: SITE CONDITION	CONSTRUCTABILITY: CONDITIONS EXTERNAL	TIME: IMPLEMENT	TIME: ACHIEVE	SAFETY & HEALTH	ENVIRONMENT
4	FEEE Materials Cover System	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	Sludge - to pond area still exposed.
	LCS, Offsite Disposal	Leachate is collected and transported to an offsite deep well injection facility. Performance of deep well injection is less.	Mechanical components may require repair after 5-10 years and possible replacement after 20 years.	O&M Requirements - Moderate. Routine maintenance on storage tank, transfer line and pump.	Storage tank leakage. Construct dikes around storage facility. LCS may become clogged. Leaks from leachate transfer line. Pump failure.	LCS may require construction below water table to provide adequate collection. 30-50% increase in time required to complete task due to safety requirements and construction techniques.	May require compliance with federal and State regulations for the transport of hazardous waste.	Leachate collection system must be installed first.	Results should be realized 1-2 months.	None.	
5	Cover System	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3
	Collection, Temporary Storage, Off-Site Disposal	See Alternative 4	See Alternative 4	See Alternative 4	See Alternative 4	See Alternative 4	See Alternative 4	See Alternative 4	See Alternative 4	See Alternative 4	See Alternative 4
	On-Site Treatment, Discharge to Large Pond	Substantially reduce or completely eliminate particulate load to large pond. Effective > 90% in reducing particulate load.	Temporary unit, treatment package 0-8 days.	Backflushing may be required, monitored to control particulate intake.	Treatment efficiency will be substantially reduced if design loads are exceeded.	Treatment efficiency and time required to complete task is directly related to weather.	None	0-8 days.	When sludge pond is pumped dry.	Work within the immediate sludge pond area requires level B respiratory protection.	None. Low metals concentrations removed before discharge to large pond.

TABLE 7

ALTERNATIVE	REMEDIAL ACTION	PERFORMANCE		RELIABILITY		CONSTRUCTABILITY		TIME		SAFETY	
		EFFECTIVENESS	USEFUL LIFE	O&M REQUIREMENTS	POSSIBLE FAILURE MODE	SITE CONDITION	CONDITIONS EXTERNAL	IMPLEMENT	ACHIEVE	IMPACTS & SAFETY	COMMUNITY
6	Cover System	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3
	Collection, Temporary Storage, and Offsite Deep Well Injection	See Alternative 4	See Alternative 4	See Alternative 4	See Alternative 4	See Alternative 4	See Alternative 4	See Alternative 4	See Alternative 4	See Alternative 4	See Alternative 4
	On-site Treatment and Discharge to Large Pond	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5
	Fill and Cover System	100% Effective in limiting human contact.	Indefinite if properly maintained	See Alternative 3	If leachate collection system fails pressure build-up may occur resulting in purging of leachate	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3
7	Cover System	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3
	Collection, Temporary Storage, Disposal Off-site	See Alternative 4	See Alternative 4	See Alternative 4	See Alternative 4	See Alternative 4	See Alternative 4	See Alternative 4	See Alternative 4	See Alternative 4	See Alternative 4
	On-site Treatment, Discharge to Large Pond	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5
	Disposal at Off-site HWF	100% Effective in removal of sludge material to RCRA landfill	Not Applicable	None (O&M Responsibility of HWF)	Possibility of component failure is substantially less at a controlled hazardous landfill than onsite landfill due to rigorous maintenance and inspections by federal, state and plant personnel.	Volume reduction by filtration must be determined by dewatering test	Must comply with federal and state regulations for the transport of hazardous waste	3 weeks	Results achieved at completion of task.	Level B protection required in the excavation and dewatering area.	

TABLE 7

ALTERNATIVE	REMEDIAL ACTION	PERFORMANCE		RELIABILITY		IMPLEMENTABILITY		TIME			COST	
		EFFECTIVENESS	USEFUL LIFE	O&M REQUIREMENTS	POSSIBLE FAILURE MODE	SITE CONDITIONS	CONSTRUCTION CONDITIONS	IMPLEMENT	ACHIEVE	ADEQUATE & SAFETY	SAFETY	COMMUNITY
8	Cover System	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3		
	Leachate Collection, Temporary Storage, Off-site Disposal	See Alternative 4	See Alternative 4	See Alternative 4	See Alternative 4	See Alternative 4	See Alternative 4	See Alternative 4	See Alternative 4	See Alternative 4		
	On-site Treatment and Discharge to Large Pond	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	
	Sludge Removal, Disposal in On-site Landfill	100% Effective on site landfill constructed according to RCRA requirements.	State-of-the-art in landfill design. Anticipated design life > 30 years.	Slope maintenance and repair. Rigorous inspection and monitoring.	Since the sludge is solidified before placing in landfill, component failure is low.	Complicated drainage system, placement of liners requires specially trained personnel.	Compliance with RCRA requirements.	Construction of landfill will require 1 year.	Results achieved upon cell closure.	Level A protection will be required.		
9	Cover System	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3		
	ECS, On-site Treatment	Modified trickling filter. Aeration - volatilizes organics. Physical treatment - limestone raises pH resulting in metal precipitation. Conventional treatment in WWTF. Performance well demonstrated.	Useful life is a function of loading and operating time.	Routine maintenance and sampling.	Increases in design loading may short circuit the treatment process.	See Alternative 4		4 months	1-2 years after completion of cover.			
	On-site Treatment and Discharge to Large Pond	See Alternative 5	SeeAlternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	
	Fill and Cover System	See Alternative 6	See Alternative 6	See Alternative 6	See Alternative 6	See Alternative 6	See Alternative 6	See Alternative 6	See Alternative 6	See Alternative 6		

TABLE 7

ALTERNATIVE	REMEDIAL ACTION	PERFORMANCE		RELIABILITY		CONSTRUCTABILITY		EASE			SAFETY	ENVIRONMENTAL
		EFFECTIVENESS	USEFUL LIFE	O&M REQUIREMENTS	POSSIBLE FAILURE MODE	SITE CONDITIONS	CONSTRUCTION CONDITIONS	IMPLEMENT	ACHIEVE			
10	Cover System	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3		
	ECS, Treatment, Disposal On-Site	See Alternative 9	See Alternative 9	See Alternative 9	See Alternative 9	See Alternative 9	See Alternative 9	See Alternative 9	See Alternative 9	See Alternative 9		
	On-Site Treatment, Discharge to Large Pond	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5		See Alternative 5
	Remove, Dispose Off-Site	See Alternative 7	See Alternative 7	See Alternative 7	See Alternative 7	See Alternative 7	See Alternative 7	See Alternative 7	See Alternative 7	See Alternative 7		
11	Cover System	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3		
	ECS, Disposal On-Site	See Alternative 9	See Alternative 9	See Alternative 9	See Alternative 9	See Alternative 9	See Alternative 9	See Alternative 9	See Alternative 9	See Alternative 9		
	On-Site Treatment, Discharge	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5		See Alternative 5
	Remove, Dispose On-Site	See Alternative 8	See Alternative 8	See Alternative 8	See Alternative 8	See Alternative 8	See Alternative 8	See Alternative 8	See Alternative 8	See Alternative 8		
12	Cover System	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3		
	In Situ Treatment	Can treat organics or metals, but not both. No driving force.	Can not be determined. GAC absorbes all priority pollutants and organics.	High removal and regeneration cost. No mechanism to determine when exhaustion occurs.	Exhaustion of permeable treatment bed would result in no treatment. Lack of discharge could result in hydrostatic build up and force contamination out of confined area. If system fails may provide driving force for off-site migration of contaminants.			1 month	No way to determine if in situ treatment is working.	Level B required within construction activity area.		
	On Site Treatment, Discharge to Large Pond	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5		
	Fill and Cover System	See Alternative 6	See Alternative 6	See Alternative 6	See Alternative 6	See Alternative 6	See Alternative 6	See Alternative 6	See Alternative 6	See Alternative 6		

TABLE 7

ALTERNATIVE	REMEDIAL ACTION	PERFORMANCE		RELIABILITY		IMPLEMENTABILITY						
		EFFECTIVENESS	USEFUL LIFE	O&M REQUIREMENTS	POSSIBLE FAILURE MODE	SITE CONDITIONS	EXTERNAL CONDITIONS	TIME TO IMPLEMENT	TIME TO ACHIEVE	SHORT-TERM EFFECTIVENESS & SAFETY		
13	Cover System	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3		
	In Situ Treatment	See Alternative 12	See Alternative 12	See Alternative 12	See Alternative 12	See Alternative 12	See Alternative 12	See Alternative 12	See Alternative 12	See Alternative 12		
	On-Site Treatment, Discharge	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	
	Remove, Disposal Off-Site	See Alternative 7	See Alternative 7	See Alternative 7	See Alternative 7	See Alternative 7	See Alternative 7	See Alternative 7	See Alternative 7	See Alternative 7		
14	Cover System	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3		
	In Situ Treatment	See Alternative 12	See Alternative 12	See Alternative 12	See Alternative 12	See Alternative 12	See Alternative 12	See Alternative 12	See Alternative 12	See Alternative 12		
	On-Site Treatment, Discharge	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	
	Remove, Disposal Off Site	See Alternative 8	See Alternative 8	See Alternative 8	See Alternative 8	See Alternative 8	See Alternative 8	See Alternative 8	See Alternative 8	See Alternative 8		

TABLE 8: SUMMARY OF THE ENVIRONMENTAL EVALUATION OF REMEDIAL ALTERNATIVES

ALTERNATIVE	BENEFICIAL EFFECTS			ADVERSE EFFECTS	
	EFFECTS ON ENVIRONMENTAL CONDITIONS	IMPROVEMENTS IN BIOLOGICAL ENVIRONMENT	IMPROVEMENTS IN HUMAN RESOURCE	CONSTRUCTION/OPERATION	MITIGATIVE MEASURES
1	•Continued infiltration through waste creating leachate. •Continued contamination surface runoff into the sludge pond area. •Direct contact with contaminated material by intruders. •Potential groundwater contamination. •Potential contamination of large pond. •No knowledge of problems spread beyond site boundaries.	None	None	None	None
2	•Continued infiltration through waste creating leachate. •Continued contamination surface runoff into the sludge pond area. •Direct contact with contaminated material by intruders. •Potential groundwater contamination. •Potential contamination of large pond. •Awareness of groundwater contamination spread beyond site boundaries.	None	None	None	None
3*	•Infiltration through fill area reduced or eliminated. •Direct contact with contaminated material by intruders eliminated for fill area and reduced for sludge pond area. •Reduction of contaminated surface runoff into sludge pond area. •Reduction of potential for groundwater contamination. •Awareness of groundwater contamination spread beyond site boundaries.	•Threat to large pond reduced. •Threat to groundwater reduced. •Intrude direct contact potential reduced.	•Improved site appearance.	Short term effects: •Release of low concentration of volatile organics expected to be creating for the cover system •Dust generation. •Community disturbance from heavy equipment.	•Personnel protective equipment onsite •Dust suppression techniques. •Control of onsite working hours. •Collect and treat contaminated runoff prior to discharge •Run-off control berm •Monitor onsite volatile organic concentrations. •Run-on exclusion berm
4	•Infiltration through fill area reduced or eliminated. •Direct contact with contaminated fill by intruders eliminated and reduced for sludge pond area. •Reduction of contaminated surface runoff into sludge pond area. •Potential for groundwater contamination reduced or eliminated. •Awareness of groundwater contamination spread beyond site boundaries.	•Threat to large pond reduced. •Threat to groundwater reduced or eliminated. •Intruder direct contact potential reduced.	•Improved site appearance. •Protection of groundwater resource.	Short term effects: •Release of low concentrations of volatile organics expected in excavating. •Dust generation. •Community disturbance from heavy equipment. •Potential increase of surface runoff contamination during excavation Long term effects: •Periodic shipment of leachate by tank truck. •Periodic maintenance activities.	

TABLE 8

ALTERNATIVE	BENEFICIAL EFFECTS			ADVERSE EFFECTS	
	FINAL ENVIRONMENTAL CONDITIONS	IMPROVEMENTS IN BIOLOGICAL ENVIRONMENT	IMPROVEMENTS IN HUMAN RESOURCE	CONSTRUCTION/OPERATION	MITIGATIVE MEASURES
5	•Infiltration through fill area reduced or eliminated. •Direct contact with contaminated material by intruders eliminated for fill area and reduced for sludge pond area. •Elimination of sludge pond. •Reduction of potential for groundwater contamination. •Awareness of groundwater contamination spread beyond site boundaries.	•Threat to large pond reduced. •Threat to groundwater reduced or eliminated. •Intruder direct contact potential reduced. •Elimination of sludge pond prevents ingestion of contaminated water by local fauna.	•Improved site appearance. •Protection of groundwater resource.	Short term effects: •Release of low concentrations of volatile organics expected in excavating. •Dust generation. •Community disturbance from heavy equipment. •Potential increase of surface runoff contamination during excavation. Long term effects: •Periodic shipment of leachate by tank truck. •Periodic maintenance activities.	•Personnel protective equipment onsite. •Dust suppression techniques. •Control of onsite working hours. •Collect and treat contaminated runoff prior to discharge. •Runoff control berm. •Monitor onsite volatile organic concentrations. •Run on exclusion berm.
6	•Infiltration reduced or eliminated. •Direct contact with contaminated materials eliminated. •Elimination of sludge pond. •Potential for groundwater contamination reduced or eliminated. •Awareness of groundwater contamination spread beyond boundaries.	•Elimination of threat to large pond. •Threat to groundwater reduced or eliminated. •Intruder direct contact eliminated. •Elimination of sludge pond prevents ingestion of contaminated water by local fauna.	•Clean site appearance. •Protection of groundwater resource. •Protection of community health.	Short term effects: •Release of low concentrations of volatile organics expected in excavating. •Dust generation. •Community disturbance from heavy equipment. •Potential increase of surface runoff contamination during excavation. Long term effects: •Periodic shipment of leachate by tank truck. •Periodic maintenance activities.	•Personnel protective equipment onsite. •Dust suppression techniques. •Control of onsite working hours. •Collect and treat contaminated runoff prior to discharge. •Runoff control berm. •Monitor onsite volatile organic concentrations. •Run on exclusion berm
7	•Infiltration reduced or eliminated. •Direct contact with contaminated materials eliminated. •Elimination of contamination in sludge pond area. •Potential for groundwater contamination reduced or eliminated. •Awareness of groundwater contamination spread beyond boundaries.	•Elimination of threat to large pond. •Threat to groundwater reduced or eliminated. •Intruder direct contact eliminated. •Elimination of sludge pond prevents ingestion of contaminated water by local fauna.	•Clean site appearance. •Protection of groundwater resource. •Protection of community health.	Short term effects: •Release of low concentrations of volatile organics expected in excavating. •Dust generation. •Community disturbance from heavy equipment. •Potential increase of surface runoff contamination during excavation. •Potential for offsite spills due to hauling to landfill. •Increased heavy equipment activity to excavate sludge pond area. Long term effects: •Periodic shipment of leachate by tank truck. •Periodic maintenance activities.	•Personnel protective equipment onsite. •Dust suppression techniques. •Control of onsite working hours. •Collect and treat contaminated runoff prior to discharge. •Runoff control berm. •Monitor onsite volatile organic concentrations. •Run on exclusion berm

TABLE 9

ALTERNATIVE	BENEFICIAL EFFECTS			ADVERSE EFFECTS	
	FINAL ENVIRONMENTAL CONDITIONS	IMPROVEMENTS IN BIOLOGICAL ENVIRONMENT	IMPROVEMENTS IN HUMAN RESOURCE	CONSTRUCTION/OPERATION	MITIGATIVE MEASURES
8	•Infiltration reduced or eliminated. •Direct contact with contaminated materials eliminated. •Elimination of contamination in sludge pond area. •Potential for groundwater contamination reduced or eliminated. •Awareness of groundwater contamination spread beyond boundaries. •Construction of an onsite landfill cell.	•Elimination of threat to large pond. •Threat to groundwater reduced or eliminated. •Intruder direct contact eliminated. •Elimination of sludge pond prevents ingestion of contaminated water by local fauna.	•Clean site appearance. •Protection of groundwater resource. •Protection of community health.	Short term effects: •Release of low concentrations of volatile organics expected in excavation. •Dust generation. •Community disturbance from heavy equipment. •Potential increase of surface runoff contamination during excavation. •Increased heavy equipment use to construct onsite landfill and excavate sludge pond area. •Expected to take 1 year to build Long term effects: •Periodic shipment of leachate by tank truck. •Periodic maintenance activities.	•Personnel protective equipment onsite. •Dust suppression techniques. •Control of onsite working hours. •Collect and treat contaminated runoff prior to discharge. •Runoff control berm. •Monitor onsite volatile organic concentrations •Run-on exclusion berm.
9	•Infiltration reduced or eliminated. •Direct contact with contaminated materials eliminated. •Elimination of contamination in sludge pond area. •Potential for groundwater contamination reduced or eliminated. •Awareness of groundwater contamination spread beyond boundaries. •Leachate treated onsite and discharged to the large pond.	•Elimination of threat to large pond. •Threat to groundwater reduced or eliminated. •Intruder direct contact eliminated. •Elimination of sludge pond prevents ingestion of contaminated water by local fauna.	•Clean site appearance. •Protection of groundwater resource. •Protection of community health.	Short term effects: •Release of low concentrations of volatile organics expected in excavating •Dust generation. •Community disturbance from heavy equipment. •Potential increase of surface runoff contamination during excavation. Long term effects: •Release of volatile organic emissions from leachate treatment system may cause odors near the treatment unit. Expected to decline as leachate flow goes to zero.	•Personnel protective equipment onsite. •Dust suppression techniques. •Control of onsite working hours. •Collect and treat contaminated runoff prior to discharge. •Runoff control berm. •Monitor onsite volatile organic concentrations. •Run-on exclusion berm.

TABLE 3

ALTERNATIVE	BENEFICIAL EFFECTS: FINAL ENVIRONMENTAL CONDITIONS	BENEFICIAL EFFECTS: IMPROVEMENTS IN BIOLOGICAL ENVIRONMENT	BENEFICIAL EFFECTS: IMPROVEMENTS IN HUMAN RESOURCE	ADVERSE EFFECTS: CONSTRUCTION/OPERATION	ADVERSE EFFECTS: MITIGATIVE MEASURES
10	•Infiltration reduced or eliminated. •Direct contact with contaminated materials eliminated. •Elimination of contamination in sludge pond area. •Potential for groundwater contamination reduced or eliminated. •Awareness of groundwater contamination spread beyond boundaries. •Leachate treated onsite and discharged to the large pond.	•Elimination of threat to large pond. •Threat to groundwater reduced or eliminated. •Intruder direct contact eliminated. •Elimination of sludge pond prevents ingestion of contaminated water by local fauna.	•Clean site appearance. •Protection of groundwater resource. •Protection of community health.	Short term effects: •Release of low concentrations of volatile organics expected in excavating. •Dust generation. •Community disturbance from heavy equipment./ •Potential increase of surface runoff contamination during excavation. •Potential for offsite spills due to hauling to landfill. •Increased heavy equipment activity to excavate sludge pond area. Long term effects: •Release of volatile organic emissions from leachate treatment system may cause odors near the treatment unit. Expected to decline as leachate flow goes to zero.	•Personnel protective equipment onsite. •Dust suppression techniques. •Control of onsite working hours. •Collect and treat contaminated runoff prior to discharge. •Runoff control berm. •Monitor onsite volatile organic concentrations. •Run on exclusion berm.
11	•Infiltration reduced or eliminated. •Direct contact with contaminated materials eliminated. •Elimination of contamination in sludge pond area. •Potential for groundwater contamination reduced or eliminated. •Awareness of groundwater contamination spread beyond boundaries. •Construction of an onsite landfill. •Leachate treated onsite and discharged to the large pond.	•Elimination of threat to large pond. •Threat to groundwater reduced or eliminated. •Intruder direct contact eliminated. •Elimination of sludge pond prevents ingestion of contaminated water by local fauna.	•Clean site appearance. •Protection of groundwater resource. •Protection of community health.	Short term effects: •Release of low concentrations of volatile organics expected in excavating. •Dust generation. •Community disturbance from heavy equipment. •Potential increase of surface runoff contamination during excavation. •Increased heavy equipment use to construct onsite landfill and excavate sludge pond area. •Expected to take 1 year to build. Long term effects: •Release of volatile organic emissions from leachate treatment system may cause odors near the treatment unit. Expected to decline as leachate flow goes to zero.	•Personnel protective equipment onsite. •Dust suppression techniques. •Control of onsite working hours. •Collect and treat contaminated runoff prior to discharge. •Runoff control berm. •Monitor onsite volatile organic concentrations. •Run on exclusion berm.

TABLE 9: ALTERNATIVE SCREENING AND EVALUATION SUMMARY

ALTERNATIVE	DESCRIPTION	TYPE OF EVALUATION						REMAINING ALTERNATIVES AFTER SCREENING AND EVALUATION	EPA CATEGORY
		INITIAL SCREENING	TECHNICAL FEASIBILITY	PUBLIC HEALTH	INSTITUTIONAL	ENVIRONMENTAL	COST		
1	No action.	1	1						
2	No action with monitoring.	2	2	(2)*				2	E
3	Fill Area Cover System	3	3						
4	Fill Area Cover System; Leachate Collection, Temporary Storage, and Offsite Disposal.	4	4	(4)*				4	A, D
5	Fill Area Cover System; Leachate Collection, Temporary Storage, and Offsite Disposal; Surface Water Treatment and Onsite Discharge	5	5						
6	Fill Area CoverSystem; Leachate Collection, Temporary Storage, and Offsite Disposal; Surface Water Treatment and Onsite Discharge; Cover System for Sludge Pond Waste	6	6	6	6	6	6	6	A, B
7	Fill Area Cover System; Leachate Collection, Temporary Storage, and Offsite Disposal; Surface Water Treatment and Onsite Discharge; Offsite Disposal of Sludge Pond Waste	7	7	7	7	7			
8	Fill Area Cover System; Leachate Collection, Temporary Storage, and Offsite Disposal; Surface Water Treatment and Onsite Discharge; Onsite Disposal of Sludge Pond Waste	8	8	8	(8)**				
9	Fill Area Cover System; Leachate Collection, Treatment, and Onsite Disposal; Surface Water Treatment and Onsite Discharge; Cover System for Sludge Pond Waste	9	9	9	9	9	9	9	B
10	Fill Area Cover System; Leachate Collection, Treatment, and Onsite Disposal; Surface Water Treatment and Onsite Discharge; Offsite Disposal of Sludge Pond Waste	10	10	10	10	10	(10)*	10	A, C
11	Fill Area Cover System; Leachate Collection, Treatment, and Onsite Disposal; Surface Water Treatment and Onsite Discharge; Onsite Disposal of Sludge Pond Waste	11	11	11	(11)*			11	C
12	Fill Area Cover System; In Situ Leachate Treatment; Surface Water Treatment and Onsite Discharge; Cover System for Sludge Pond Waste	12							
13	Fill Area Cover System; In Situ Leachate Treatment; Surface Water Treatment and Onsite Discharge; Offsite Disposal of Sludge Pond Waste	13							
14	Fill Area Cover System; In Situ Leachate Treatment; Surface Water Treatment and Onsite Discharge; Onsite Disposal of Sludge Pond Waste	14							
15	Offsite Disposal of Fill Area Waste; Leachate Collection, Temporary Storage, and Offsite Disposal; Surface Water Treatment and Onsite Discharge; Offsite Disposal of Sludge Pond Waste								

()* - Eliminated alternative, but carried through to final, based on EPA category designation.

()**. Only carried to cost evaluation, where eliminated.

Only two alternatives, Alternatives 6 and 9, passed all the screening and detailed evaluations. Alternatives 2, 4, 10, and 11 are listed with Alternatives 6 and 9 for the reason described above.

Table 10 is a source control alternative summary for the six alternatives carried through the entire screening process. Included in this table are capital cost and present worth values. Alternative 2 has the lowest present worth value and Alternative 6 has the highest present worth value. The table also includes summaries of public health concerns, environmental concerns, technical concerns, and community response concerns for each alternative.

TABLE 19: SOURCE CONTROL ALTERNATIVES SUMMARY

Alternative	Description	Cost ($1,000) Capital	Cost ($1,000) Present Worth	Public Health Concerns	Environmental Concerns	Technical Concerns	Compliance with ARARs and Other Criteria
2	No action with monitoring	0	185.47	Direct contact with contaminated material by intruders. Possible spread of contamination into surrounding environment.	Possible spread of contamination into surrounding environment.	None	Unacceptable from public health standpoint. Does not alleviate any of the public health effects identified.
4	Fill Area Cover System; Leachate Collection, Temporary Storage, and Offsite Disposal	355.1	2319.5	Direct contact with contaminated material by intruders; chance of spillage of leachate during transit to offsite disposal facility. Untreated leachate still present at site.	Possible spread of contamination into surrounding environment. Noise, dust and odor nuisance during remedial action.	Integrity of cover. Storage tank leakage. LCS may become clogged. Leaks from leachate transfer line. Pump failure.	Unacceptable; not a complete remedial action.
6	Fill Area Cover System; Leachate Collection, Temporary Storage and Offsite Disposal; Surface Water Treatment and Onsite Discharge; Cover System for Sludge Pond Waste	460.7	2456.9	Potential for offsite spillage of leachate during transport. Untreated leachate still present at site.	Noise, dust and odor nuisance during remedial action.	See Alternative 4	Acceptable
9	Fill Area Cover System; Leachate Collection, Treatment and Onsite Disposal; Surface Water Treatment and Onsite Discharge; Cover System for Sludge Pond Waste	462.0	696.7	Untreated leachate still present at site.	Noise, dust and odor nuisance during remedial action. Release of low concentrations of volatile organics from the leachate treatment system.	Integrity of cover. Increases in design loading may short circuit leachate treatment process. If LCS fails, pressure build up may result in leachate leakage.	Acceptable
10	Fill Area Cover System; Leachate Collection, Treatment and Onsite Disposal; Surface Water Treatment and Onsite Discharge; Offsite Disposal of Sludge Pond Waste	1595.4	1798.0	Sludge spillage during transport to an offsite facility. Untreated leachate still present at site.	See Alternative 9	See Alternative 9	Acceptable
11	Fill Area Cover System; Leachate Collection, Treatment and Onsite Disposal, Surface Water Treatment and Onsite Discharge; Onsite Disposal of Sludge Pond Waste	936.4	1169.2	Untreated leachate still present at site.	See Alternative 9	See Alternative 9	Acceptable

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SECTION VI
COMMUNITY RELATIONS

The first community relations meeting to inform nearby residents of the Remedial Investigation findings was held on May 9, 1985. Approximately 60 people attended the meeting. Initial findings of the Site Investigation were discussed. The public was informed that the chemical data showed that no contaminants were migrating from the site.

The public meeting to discuss the Feasibility Study was held on July 31, 1986; approximately 25 people attended the meeting. A formal presentation was given discussing the RI/FS, the proposed remedy, and the immediate removal of PCB contaminated soils.

Following the formal presentation, the meeting was open to questions from the public. The questions raised indicated concerns about the type of contaminants on site; the probability of the contaminants migrating into adjacent properties; the clean-up activities and cost of activities; the duration of site monitoring; and the present dangers to persons entering the site.

It appears that the local community is aware of both the immediate and future problems related to Pioneer Sand and that community interest is moderate at this time.

SECTION VII
CONSISTENCY WITH OTHER ENVIRONMENTAL LAWS

Environmental standards and criteria that may be applicable or relevant to the site include:

- Florida DER Water Quality Standards for Class G-II Groundwaters
- Florida Water Quality Standards for Class-III Surface Waters
- Resource Conservation and Recovery Act (RCRA)
- Toxic Substances and Control Act (TSCA)
- Clean Water Act (CWA)
- Clean Air Act (CAA)
- 1980 EPA Ambient Water Quality Criteria
- Safe Drinking Water Act (SDWA)
- O.S.H.A. Permissible Exposure Limits
- Chapter 17-7 of the Florida Administrative Code

EPA RCRA regulations are not legally applicable to the Pioneer Sand Superfund Site because the sludge and fill material samples analyzed for EP-Toxicity did not meet the definition of a hazardous waste as specified in 40 CFR 261. These regulations are relevant in regard to the public health evaluation because one of the fill material samples contained cadmium and lead concentrations which approach the extraction procedure toxicity characteristics for hazardous wastes.

The EPA National Interim Primary Drinking Water standards (Maximum Contaminant Levels) apply to public water systems. Since the groundwaters underlying the site are used for only private water supply, the MCLs do not specifically apply. However, the Florida DER Water Quality Standards for groundwaters (Class G-II), which are equal to or more stringent than the MCLs are applicable standards. These standards apply to potable groundwater in aquifers which contain less than 10,000 mg/l of Total Dissolved Solids. Therefore, these standards were used to evaluate groundwater quality. The Clean Water Act Water Quality Criteria for Human Health and Safe Drinking Water Act Health Advisories will also be used as guidelines for groundwater quality.

The Florida DER Surface Water Quality Standards are not legally applicable to the large pond because these waters are not defined as surface waters of the state. However, the Class III standards for surface waters will be used as guidelines in the evaluation of the surface waters of the large pond since the waters have been used for recreational fishing and waterfowl hunting in the past.

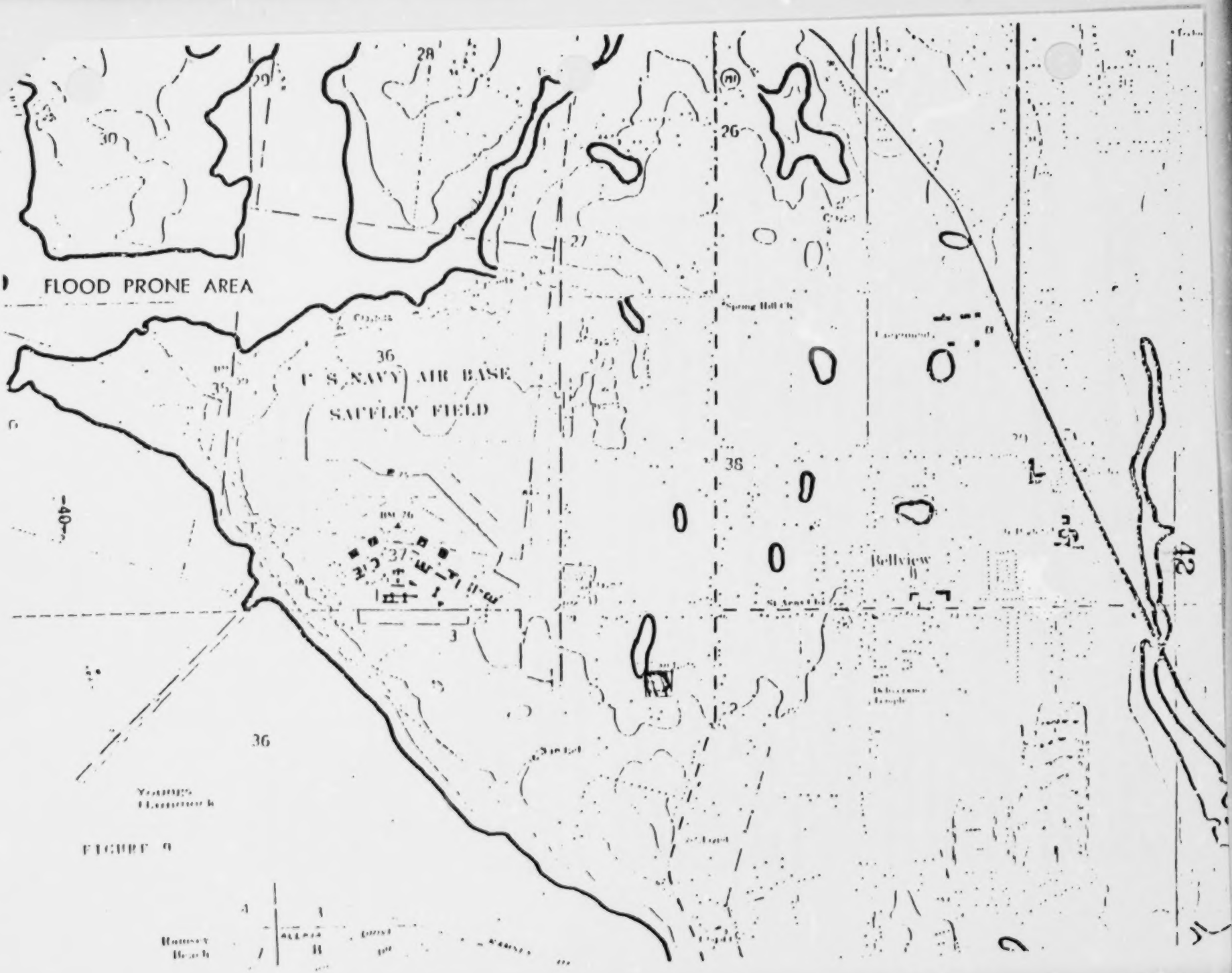


FIGURE 9

The EPA National Ambient Air Quality Standards are not specifically applicable to the site, but were used as guidelines in evaluation of ambient air quality.

The O.S.H.A. Permissible Exposure Limits (PEL) apply to the inhalation exposures that workers may suffer during remedial actions.

No permits are required for the installation of the leachate collection system (LCS). Volatile organic emissions from the excavation of the trench may require a CAA permit. The Safe Drinking Water Act is not applicable to this system since it is not discharging pollutants to the groundwater bearing zone. The construction phase of the trench and LCS will require close compliance with NIOSH regulations. OSHA should be alerted during this phase due to the enclosed space of the trench.

The leachate treatment system will not need a discharge permit. F.A.C. 1-6.010(1) states "no wastes are to be discharged to any waters of the state without first being given the degree of treatment necessary to protect the beneficial uses of such water." Discharge to the large pond does not leave the boundaries of the site and it is not considered by the State as waters of Florida; therefore, no discharge permit will be required. Discharge limitation on the treated leachate are also not applicable under the Safe Drinking Water Act since the pond water is not a drinking water source; however, leachate cleanup standards will be addressed in the design phase of the project. The cleanup standards will probably be in accordance with the MCL's. The aerator portion of the treatment system will emit low levels of volatile organics, but will probably not trigger the CAA or local and State regulations for emissions.

All known areas of PCB concentrations in soils 50 ppm and above have been removed. Isolated patches of PCB contamination less than 50 ppm remain in the fill area, but none of this contamination has migrated off the site. There does not appear to be any physical mechanism for transport offsite of the remaining low levels of PCB's since the fill area is not subject to flooding or stream erosional processes. Furthermore, the fill area will be covered by 2 feet of clay and 1 foot of topsoil to reduce infiltration.

The Natural Resource Damage Assessment, conducted by the Fish & Wildlife Service has concluded that there are no lands or facilities under the Department of the Interior's trust which have been impacted by contaminants from this site.

The Pioneer Sand Site is not in an area that is subject to inundation from storm surges associated with tropical systems (Figure 9). The topography of the site dictates that periodic ponding will occur, specifically in the depressed area associated with the large pond.

The recommended alternative is Alternative 9: Fill Area Cover System; Leachate Collection, Treatment, and Onsite Disposal; Surface Water Treatment and Onsite Discharge; and Cover System for Sludge Pond Waste. (Figures 10 and 11).

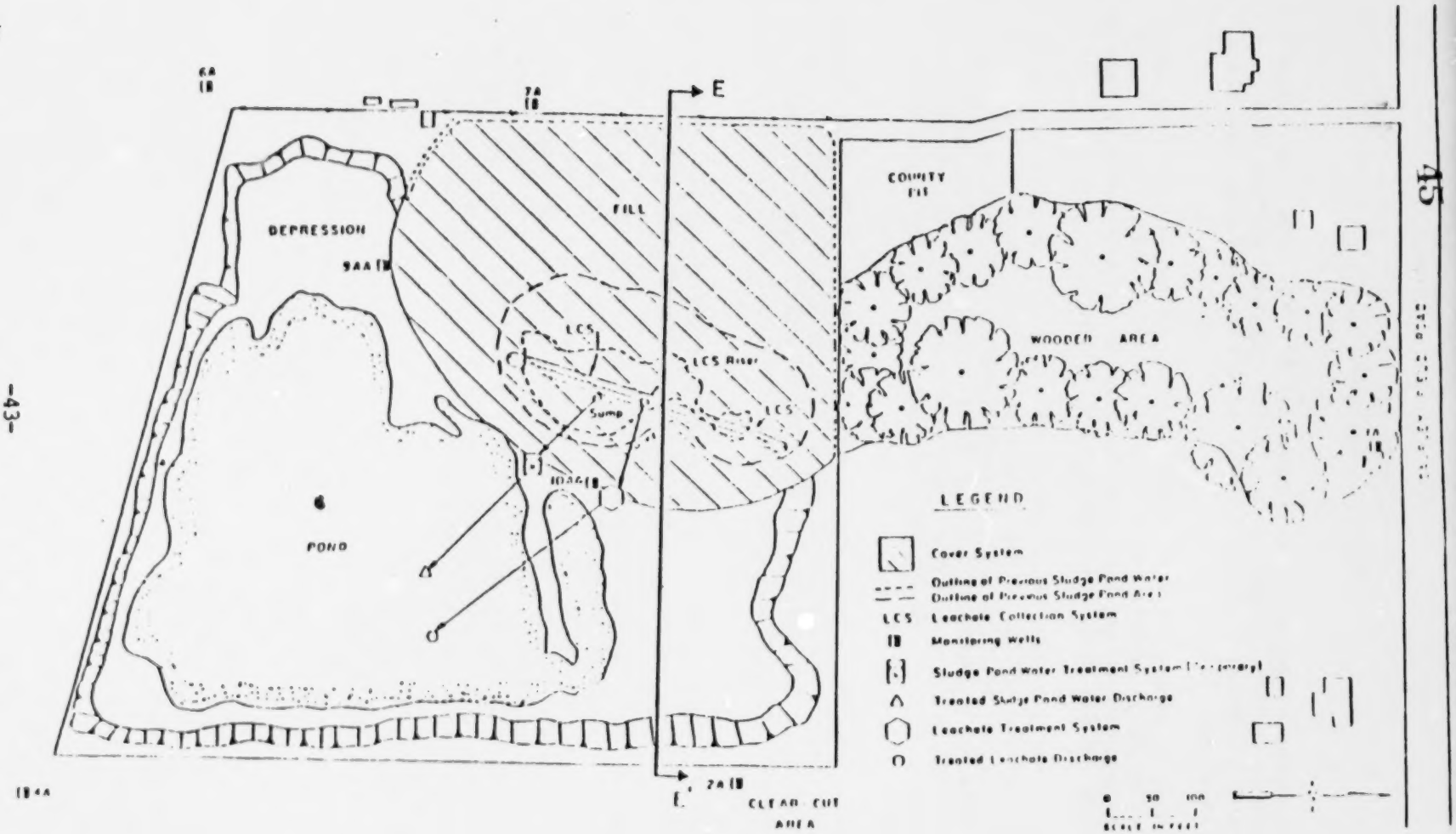
The remedy is consistent with 40 CFR Part 300.68 (J) in that alternative 9 is technically feasible, alleviates all existing and potential health effects, presents no new public health hazards and substantially reduces the threat to the surface and groundwater (Table 11).

The fill area and sludge pond area cover system will consist of a cover with a 3-5% slope consisting of approximately two feet of clay ($K < 10^{7}$, cm/s) and one foot of top soil that will adequately reduce infiltration (Figure 12). Since this cover system will not be as effective in eliminating all infiltration, a minor amount of leachate may be generated. Specific soil thicknesses and cover design will be based on a detailed engineering analysis.

Preference is given to this option rather than to the RCRA cover because of its lower capital and O&M requirement while meeting the remedial objectives. Modification of the cover may be required in order to satisfy design requirements and site conditions (i.e., condition of the fill material area base).

Leachate will be collected, treated, and disposed of onsite. The leachate will be collected through the use of a subsurface installed drainage system (Figure 13). Once the leachate reaches the riser, it will be pumped to a treatment unit. Leachate treatment will be accomplished by a limestone buffer and volatilization system. Soluble metals will be removed after precipitation as a result of being flushed through the limestone. Aeration will effectively diminish volatile organics to acceptable levels. Metal carbonate sludges will be collected in a sludge well and removed from the site by vacuum truck, as needed. The treated leachate will be disposed of in the large pond. Periodic monitoring of the treated leachate will assess the effectiveness of the treatment operation (Figure 14).

The sludge pond waters will be treated and disposed of onsite. Analysis of the sludge pond waters detected very low concentrations of copper and zinc, but the sediments in the sludge pond have significant concentrations of metals and organics. The entrainment of these sediments during water removal is a concern; therefore, the sludge pond water will be pumped into a settling basin where heavy and large particulates will be removed. Pumpage through a filter system will remove fine particulates. The resulting "clean" effluent will then gravity flow to the large pond. Periodic monitoring of the effluent will be necessary to assess if additional treatment is needed. Particulates collected in the filtration process will be disposed of in the sludge pond or at an appropriate offsite landfill.


E
E'
DEPRESSION
FILL
COUNTY
FIE
WOODED AREA
LCS
LCS Riser
Sump
POND
CLEAR-CUT
AREA
LEGEND
Cover System
Outline of Previous Sludge Pond Water
Outline of Previous Sludge Pond Area
LCS Leachate Collection System
Monitoring Wells
Sludge Pond Water Treatment System (Discharge)
Treated Sludge Pond Water Discharge
Leachate Treatment System
Treated Leachate Discharge

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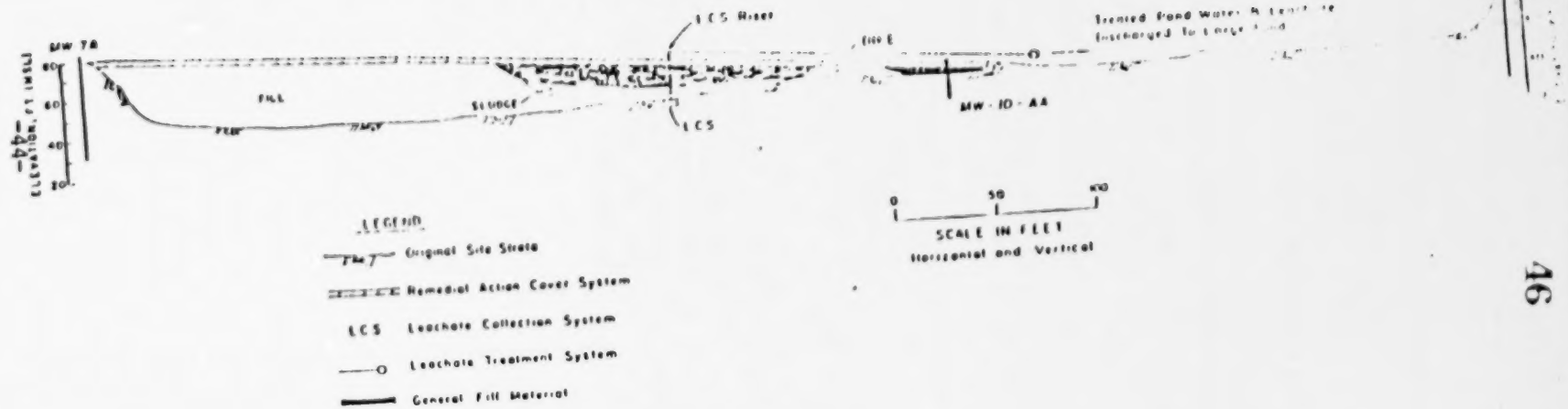


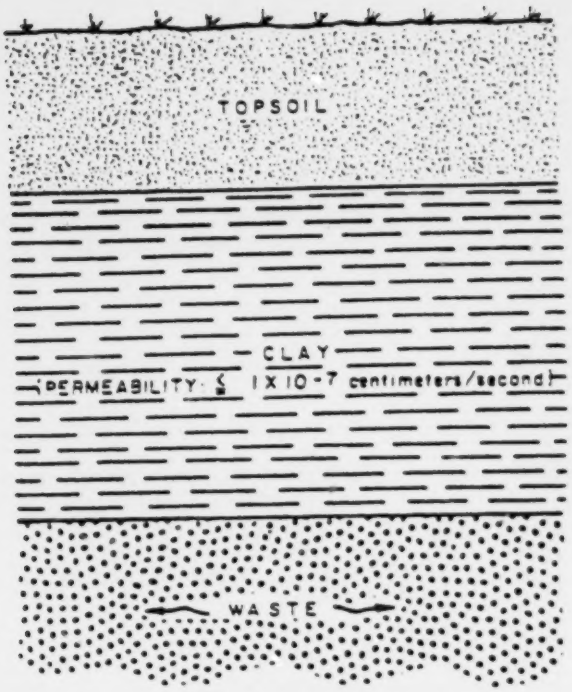
FIGURE 11: Cross-Section of Site

Table 11. Summary Table of Feasible Alternatives

Remedial Alternative	Reason for Non-Selection
1. No Action	Eliminated because it does not alleviate public health effects such as direct contact and ingestion routes and potential for offsite migration via groundwater route.
2. No Action With Monitoring	Eliminated based on the public health concerns stated in the No Action decision.
3. Fill Area Cover System	Eliminated based on public health concerns because exposures through contact with sludges, soils, and leachates in the sludge pond area are not eliminated.
4. Fill Area Cover System; Leachate Collection, Temporary Storage, and Offsite Disposal	Eliminated based on public health concerns. Alternative does not eliminate exposure to contaminants in sludge pond area.
5. Fill Area Cover System; Leachate Collection, Temporary Storage, and Offsite Disposal; Surface Water Treatment and Onsite Discharge	Eliminated based on public health concerns. Alternative does not eliminate exposure to contaminants in sludge pond area.
6. Fill Area Cover System; Leachate Collection, Temporary Storage, and Offsite Disposal; Surface Water Treatment and Onsite Discharge; Cover System for Sludge Pond Waste	Passed all screening evaluations, but also had the highest present worth value. A less costly remedy will attain applicable and relevant Federal, public health, and environmental standards.
7. Fill Area Cover System; Leachate Collection, Temporary Storage, and Offsite Disposal; Surface Water Treatment and Onsite Discharge; Offsite Disposal of Sludge Pond Waste	Exceeds environmental requirements but eliminated due to excessive costs. Annual O&M >$200,000.
8. Fill Area Cover System; Leachate Collection, Temporary Storage, and Offsite Disposal; Surface Water Treatment and Onsite Discharge; Onsite Disposal of Sludge Pond Waste	Exceeds environmental requirements, but eliminated due to high costs. Less expensive remedy available that meets environmental requirements.

Table 11 (cont.). Summary Table of Feasible Alternatives

Remedial Alternative	Reason for Non-Selection
9. Fill Area cover System; Leachate Collection, Treatment, and Onsite Disposal; Surface Water Treatment and Onsite Discharge; Cover System for Sludge Pond Waste	This is the recommended alternative.
10. Fill Area Cover System; Leachate Collection, Treatment, and Onsite Disposal; Surface Water Treatment, and Onsite Discharge; Offsite Disposal of Sludge Pond Waste	Exceeds environmental standards, but eliminated due to excessive costs.
11. Fill Area Cover System; Leachate Collection, Treatment, and Onsite Disposal; Surface Water Treatment and Onsite Discharge; Onsite Disposal of Sludge Pond Waste	Exceeds environmental requirements, but eliminated due to excessive costs.
12. Fill Area Cover System; In Situ Leachate Treatment; Surface Water Treatment and Onsite Discharge; Cover System for Sludge Pond Waste	This alternative is not technically feasible because of low removal efficiencies and no effective way to monitor treated leachate.
13. Fill Area Cover System; In Situ Leachate Treatment; Surface Water Treatment and Onsite Discharge; Offsite Disposal of Sludge Pond Waste	Same as Alternative 12.
14. Fill Area Cover System; In Situ Leachate Treatment; Surface Water Treatment and Onsite Discharge; Onsite Disposal of Sludge Pond Waste	Same as Alternative 12.



NON-RCRA COVER

SCALE: not to scale

FIGURE 12: Non-RCRA Cover

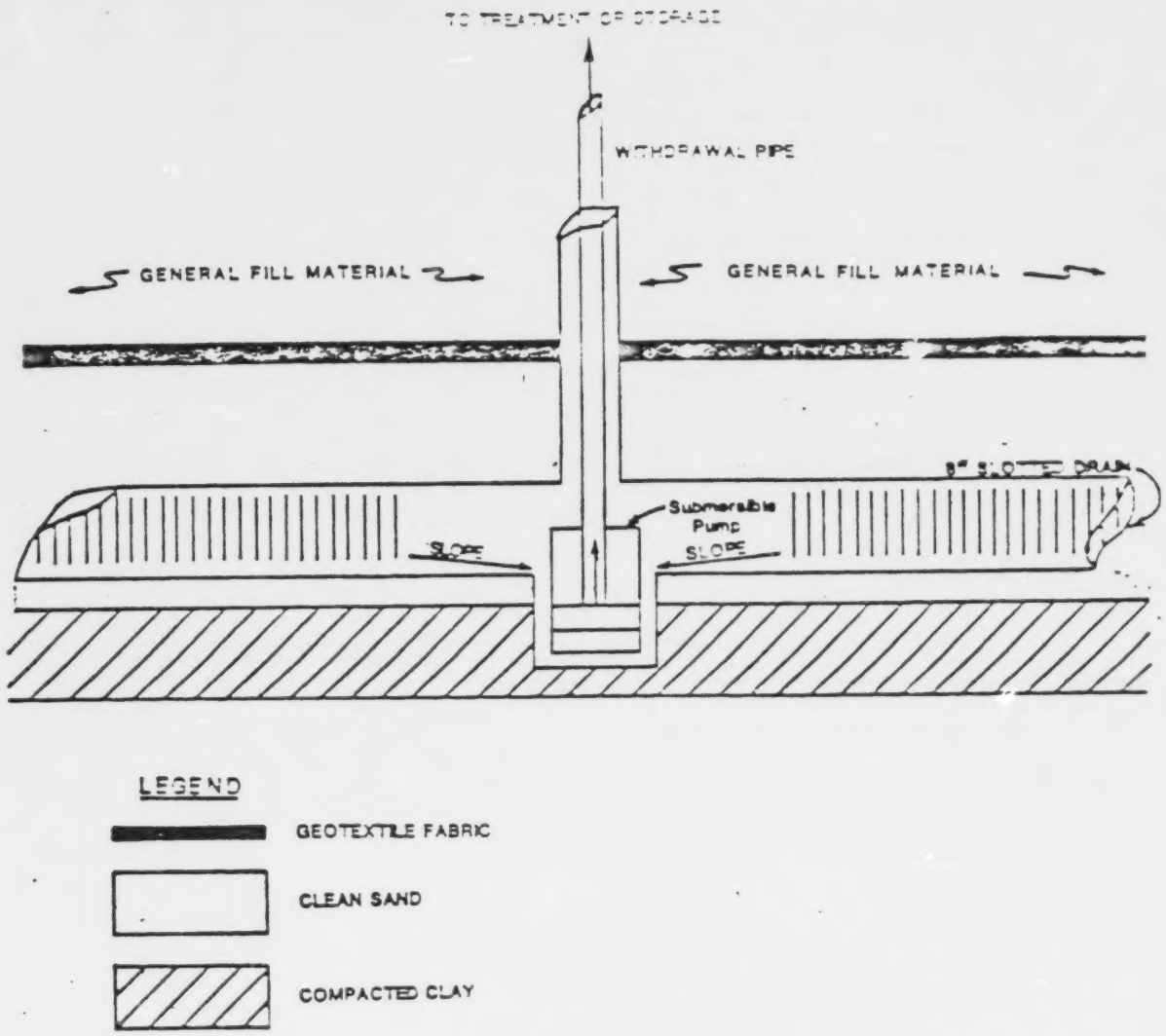
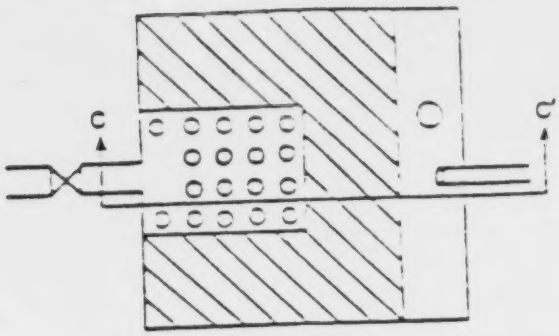
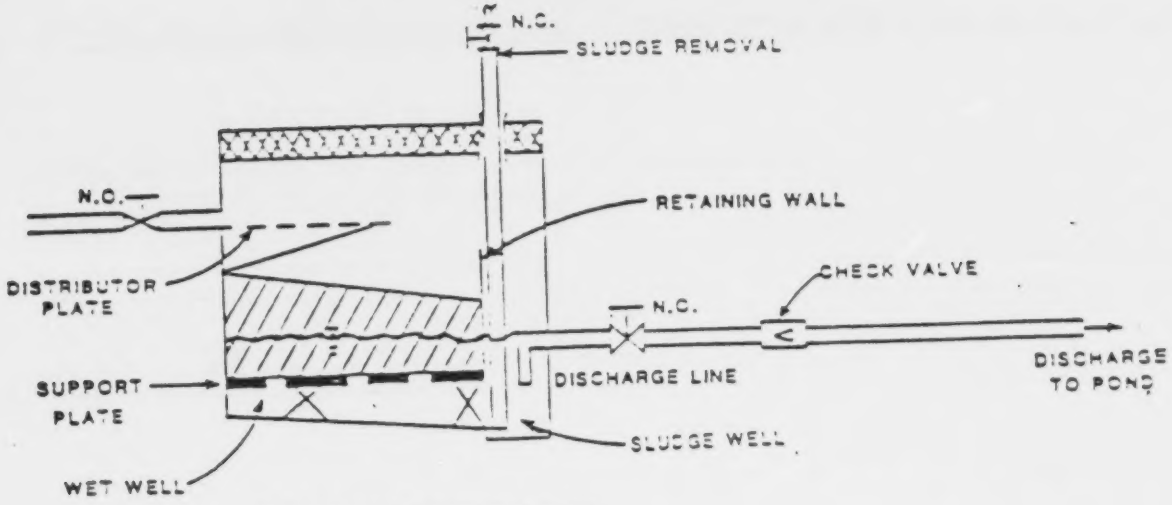


FIGURE 13: Leachate Collection System



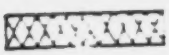
TOP VIEW



CROSS-SECTION C–C'

LEGEND

- LIMESTONE PACKING



- OPEN GRATING

NO-Normally Open

NC-Normally Closed

FIGURE 14: Leachate Treatment System

Groundwater monitoring will be initiated during the first year of implementing the Remedial Action. Samples shall be taken from the seven wells (1A, 2A, 4A, 6A, 7A, 9AA, and 10AA) on a quarterly basis. The first sampling of the monitoring wells will be conducted prior to any remedial activities to establish pre-construction conditions. If no positive trends are observed during the first year of analysis, the sampling will continue semi-annually as long as background conditions persist, or for 20 years beyond completion of the Remedial Activities.

Analysis of samples will be in accordance with EPA analytical standards and will include the following indicator parameters:

Metals	Organics
Chromium	Priority Pollutant Acid Extractables
Zinc	Priority Pollutant Purgeables
Lead	Pesticides and PCB's

The selection of indicator parameters is based upon numerous previous priority pollutant analyses conducted during the Remedial Investigation phase. Although other types of contaminants were present onsite, these metals and compounds are among the most common and mobile found on the Pioneer Sand Site.

A detailed cost development and analysis of selected remedial alternatives was done to assure that the most cost-effective remedial action was chosen for the Pioneer Sand Site. Cost estimates followed the procedures specified in 40 CFR 300.68(8)(2)(B), Guidance on Feasibility Studies under CERCLA, and Remedial Action Costing Procedures Manual.

Fourteen remedial action alternatives underwent the evaluation process. On the basis of technical feasibility, public health and welfare, and environmental evaluations six of the initial alternatives were eliminated from further consideration. A detailed cost analysis was performed for each of the remaining eight alternatives. These alternatives are listed and described in Table 12.

A breakdown of the capital and operation and maintenance cost for the recommended alternative is given in Table 13. This alternative showed lesser present worth variations than most of the other alternatives. The variations associated with the present worth were due to the uncertainty in annual operation and maintenance cost.

Operation and Maintenance (O&M) contingencies include groundwater monitoring and well maintenance. O&M will continue for 20 years after the start of Remedial Actions. Maintenance of the cap, leachate collection system, and sludge removals are included in the O&M costs.

Table 12. Summary of Sensitivity Analysis.

	Present Worth ($1000) (5%)		(10%)		(11%)	
	High	Low	High	Low	High	Low
Alternative 3	193.1	193.1	115.47	115.47	83.0	83.0
Alternative 4	5027.8	2681.4	3301.7	1730.4	2352.8	1349.7
Alternative 6	5206.6	2818.6	3376.3	1897.2	2501.7	1456.8
Alternative 7	6514.3	3672.7	4704.3	2771.6	3839.3	2341.0
Alternative 8	5714.9	3252.8	3885.8	2332.6	3011.8	1892.8
Alternative 9	866.1	824.2	717.7	675.8	646.8	604.9
Alternative 10	2173.8	1678.6	2045.6	1550.4	1984.4	1489.2
Alternative 11	1374.3	1258.5	1227.1	1111.3	1156.7	1040.9

TABLE 13
CAPITAL, OPERATION & MAINTENANCE COSTS FOR REMEDIAL ALTERNATIVES
PLUMER SAND SITE
PENSACOLA, FLORIDA

	Capital Costs	Operation and Maintenance (Annual)
Alternative 9		
Fill Cover System		
. Excavation	73,050	
. Cover Material Cost	49,300	
. Cover Material Emplacement	45,950	
. Fencing	13,800	
. Indirect Costs		
Engineering & Design	27,300	
Contingency	18,200	
. Groundwater Monitoring		10,1[illegible]*
		17,8[illegible]
Leachate Collection & On-site Disposal		
. Electricity	85,100	
. Cost of Collection System	18,000	
. Indirect Costs		
Engineering & Design	15,500	
Contingency	10,300	
		3,7[illegible]
Drainage of Small Pond	1,000	
Sludge Pond Area Cover		
. Cover Material Cost	42,800	
. Cover Material Emplacement	40,000	
. Seeding & Fertilizing	900	
. Indirect Costs		
Engineering & Design	12,555	
Contingency	8,370	
		3,4[illegible]
TOTAL	462,025	34,[illegible]

* $20,200 for year #1

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SECTION IX
OPERATION AND MAINTENANCE (O&M)

ANNUAL O&M

Annual Operating and Maintenance (O&M) costs for the Pioneer Sand site were estimated at $24,900 per year. Additionally, groundwater monitoring costs are estimated to be $20,000 for the first year and $10,000 for subsequent years. A breakdown of the O&M needs and costs are as follows:

1. Sludge Pond Maintenance needs include mowing and erosion control, contingency costs, and engineering reports Estimated annual costs are $3,400/year.

2. Cover System Maintenance needs include mowing and erosion control, fence repair, contingency costs, and engineering reports. Estimated annual costs are $17,800/year.

3. Onsite Water Disposal costs for the leachate treatment system include electricity, replacement limestone, and contingency costs. Estimated annual costs are $3,700.

4. Groundwater Monitoring costs and needs are as follows:

   a) Sampling for year #1 will include four sampling events at an estimated cost of $20,000.

   b) Sampling for years 2 thru 20 will include semi-annual sampling at an estiated cost of $10,000/year.

   c) Contingency costs will be $200 for the first year and $100 for subsequent years.

   d) Well upgrading will occur after year 10. Costs are estimated at $3,100 for the upgrading event.

FUNDING

The State of Florida has instituted a program for dealing with hazardous waste sites. This program is designed on the CLRCLA model and is operated similarly to Superfund through the Florida Department of Environmental Regulation. The State of Florida has agreed to fund 10% of the cost for implementing the selected remedial action.

After the remedial action has been implemented, EPA will provide O&M costs for one year. At the end of the first year, the State of Florida will assume the responsibility for O&M. A letter expressing concurrence by the State of Florida is in Appendix E.

These arrangements will be negated should the PRPs agree to undertake the RD/RA operations as outlined in this document.

SECTION X
PROJECT SCHEDULE

The schedule for the RD/RA phases of the Pioneer Sand site remediation are dependent on the success of enforcement negotiations. If the PRPs agree to undertake RD/RA, the schedule will be negotiated to accommodate EPA, FDER, and the PRPs.

If, however, negotiations with the PRPs are unsuccessful, EPA will follow the schedule outlined below:

Schedule Landmark	Date for Implementation
1. Finalization of the ROD	9/30/86
2. Complete Enforcement Negotiations	11/28/86
3. Award Contract for Design	1/30/87
4. Initiate Design	3/2/87
5. Complete Design	9/1/87
6. Award/Amend Superfund State Cntract (and IAG) for Construction	9/30/87
7. Initiate Construction	11/2/87
8. Complete Construction	11/1/88

SECTION XI
FUTURE ACTIONS

Future remedial activities to complete site response will include O&M actions. The O&M activities are discussed in Section IX.

APPENDIX A

Responsiveness Summary

3.0 CONCERNS RAISED DURING THE PUBLIC MEETING

1. Source of Comment: Mr. Berling

Public Meeting

Response From: Robert Leighton, WCC

Comment

What was the distance from the site to the private wells?

Response

Woodward-Clyde Consultants inventoried wells within a one-mile radius of the Pioneer Sand Site. The purpose of the inventory was to: 1) locate all wells in the vicinity of the site which may be adversely impacted, 2) determine the number of wells and their usage in the area (potable supply, irrigation, etc.), 3) locate wells to be sampled for extensive chemical analysis, and 4) establish background water quality.

The well location map was compiled using existing project data, information from the Northwest Florida Water Management District, the U.S. Geological Survey, local well drillers, and a door-to-door inventory of local residents. Well locations were field verified and plotted on a base map. All specific well information, depth screened interval, etc., has also been recorded in Appendix I of the Pioneer Sand Site Investigation Report. Eighty-six wells were inventoried ranging in size from two to four inches in diameter and from approximately 40 to 200 feet in depth. The closest public supply well to the Pioneer Sand Site is the Avondale Well located about 5000 feet southeast of the Pioneer Sand Site. Wells currently in use within the mile radius were categorized as either a domestic well for potable water supply or as non-potable. To the best of our knowledge all residents adjacent to the site rely upon the county water system for their source of potable supply except for 1) Mrs. Hayes, who is located approximately 1000 feet southeast of the site, 2) Mr. Blum and 3) Mrs. Eva Johnson, both located about 500 feet north of the site (upgradient).

Fifteen private wells within a one-mile radius of the site were sampled and screened for volatile organics. Seven private well samples, two upgradient and five downgradient, were selected for complete Priority

Pollutant scans. No contamination attributable to the site was found in any of the nearby private wells.

For additional information see pages 48-50, 141-145 and 153-157 of the Pioneer Sand Site Investigation.

2. Source of Comment: Unidentified Speaker

Public Meeting

Response From: Robert Leighton, WCC

Comment

What were the findings of the sediment analysis in the small (sludge) pond?

Response

Three pond sediment samples were field screened for Polynuclear Aromatic Hydrocarbons (PAHs) and volatile aromatic hydrocarbons. Toluene was detected in the pond sediments of the small and medium ponds below significant concentrations. The fluorescence data suggested that the small and medium ponds were contaminated with PAHs and other semi-volatile fluorescing compounds.

Two of the small (sludge) pond sediment samples were analyzed for Priority Pollutants. The small (sludge) pond sediment samples contained significant concentrations of the following metals: cadmium, copper, chromium, lead, nickel and zinc.

Extraction Procedures (EP) Toxicity testing for metals was performed on duplicate samples. Results indicate concentrations above the detection limits but significantly below the maximum concentration level established by FDER.

Cyanide concentrations in all pond sediment samples were insignificant.

The organic Priority Pollutant analysis revealed the presence of low concentrations of phthalates in all pond sediments. Sediments in the small pond had high concentration of phthalates and low concentrations of dinitrotoluene, dichlorobenzene, napthalene, phenolics, toluene, and xylene.

In summary, the sediments in the small (sludge) ponds contain metal and organic constituents which appear to be almost identical to the fill material.

3. Source of Comment: Unidentified Speaker

Public Meeting

Response From: Dr. Thomas Kwader, WCC

Comment

Why is there less a possibility of contamination in the deeper monitoring wells?

Response

There is an extremely low probability of contaminating the deeper monitoring wells because underlying the whole site is a clay lense, a good competent clay lense. This lense can be found in all corners of the site in uniform thickness. Its low permeability is very effective in keeping the waters in the surficial aquifer (upper fifty feet) and the Floridan aquifer separate.

4. Source of Comment: Mr. Thigpen

Public Meeting

Response From: Robert Leighton, WCC

Comment

Why spend approximately $700,000 in remedial action if there is no off-site contamination:

Response

Extensive chemical, hydrological and geological investigations conducted at the Pioneer Sand Site confirm that the contaminants dumped at the Pioneer Sand Site from 1973 to 1979 have not migrated off-site at this time. Factors favoring the immobility of contaminants include; 1) the clayey cap covering the contaminants, which greatly limits the amount of flushing of chemicals into the ground water; 2) relative low permeability of the fill material which tends to limit the amount of groundwater flow through the fill; 3) lack of surface drainage features away from the site, i.e., transport of chemical via streams away from the site; and 4) the high vapor pressure of the more mobile compounds (i.e., benzene, toluene) which tend to volatilize in extremely short distances.

Based upon the conclusion of the site investigation the objectives of the remedial action are to:

- maintain or improve the surface and groundwater quality on-site;
- maintain the natural groundwater quality adjacent to the site;
- minimize leachate generation within the fill material by limiting groundwater percolation through the fill material;
- minimize human contract with the sludges and small pond waters; and
- protect future surface and groundwater quality by establishing a monitoring program to detect changes in surface water quality on-site and groundwater quality both on-site and off-site.

In order to achieve the above objectives, the fill material and small (sludge) pond area will be capped, and a leachate collection and treatment system installed to collect and treat any leachate originating from the fill material. In addition to these protective measures, a groundwater monitoring program will be implemented to provide an early warning system if site characteristics change.

These steps are being taken by FDER and U.S. EPA to provide the maximum long-term protection of the public health and environment.

For additional information and a detailed cost breakdown of the proposed remedial action, see the Pioneer Sand Feasibility Study Report, pages 237-247.

5. Source of Comment: Mr. Angers (Phonetic spelling)

Public Meeting

Response From: Dr. Thomas Kwader, WCC

Comment

We were talking about contamination of wells due to the Pioneer Sand pit here. But if other wells in the neighborhood within a mile radius or so, as this gentleman says, are contaminated, can that contamination come from someplace else?

Response

Absolutely; and that's part of the problem. If we start sampling wells too far away and we start seeing contamination, we may have to start looking for other sources of contamination, which is not part of this study. Unless we have a reason to believe that there is another source of contamination, your local DER will go out and investigate that.

6. Source of Comment: Mr. Thigpen

Public Meeting

Response From: Robert Leighton, WCC

Comment

Describe the monitoring program and its cost.

Response

The monitoring plan proposed to monitor groundwater quality at the Pioneer Sand Site, both during and after Remedial Activities, will consist of eight shallow wells already installed at the site.

Analytical Procedures will include the following set of indicator parameters to detect the possible presence of leachate migrating from the area. Analyses will be in accordance with EPA guidelines as set forth in the QA/QC portion of the Work Plan.

Metals	Organics
Chromium	Priority Pollutant Acid Extractables
Zinc	Priority Pollutant Purgeables
Lead	PCB-1242 and PCB-1254

The selection of indicator parameters is based on numerous previous priority pollutant analyses conducted during the Remedial Investigation phase. Although other types of contaminants are present on site, these metals and compounds are among the most common and mobile found on the Pioneer Sand Site.

Sampling Frequency

During the first year of implementing the Remedial Action, samples will be taken from the seven wells on a quarterly basis at a cost of $22,000. The first sampling of the monitoring wells will be conducted prior to any remedial activities to establish pre-construction conditions. If no positive trends are observed during the first year

of analysis, the sampling will continue semi-annually at a cost of approximately $11,000 per year as long as background conditions persist, or for 30 years beyond completion of the Remedial Activities.

Additional information concerning the proposed sampling program is found on pages 84-88 and page 237 of the Pioneer Sand Feasibility Study.

7. Source of Comment: Mr. Thigpen

Public Meeting

Response From: Robert Leighton, WCC

Comment

Can Superfund monies be used to finance municipal water projects (hook residents into municipal water systems)?

Response

No, the use of Superfund monies is very specific. Only if there is an immediate threat to public health can the monies be used to obtain an alternate water supply.

4.0 CONCERNS RAISED DURING THE COMMENT PERIOD

8. Source of Comment: Audubon Letter - 8/13/86

Dorothy S. Kaser, Chair

Response From: Robert Leighton, WCC

Comment:

What is the possibility that in the future the site could be sold for development?

Response - Robert Leighton, WCC

Presently there is no land use planning or zoning for the area surrounding the Pioneer Sand Site. Escambia County is under an order by the Governor and Cabinet to adopt land use regulations by 1987. Until such time it is recommended that:

- a fence be erected to protect the integrity of the cover system;
- any proposed land use must demonstrate that the activity will not adversely impact surface and ground water quality as well as reduce the integrity of the remedial design;
- any proposed land use must demonstrate that it will maximize the Health and Safety of the persons utilizing the site as well as the adjacent residents; and,
- any proposed land use must not adversely impact surrounding land use.

Upon adoption of land use regulations in Escambia County it is further recommended that the site be classified as heavy industrial or special use with a note referring to the Pioneer Sand Site Investigation, Feasibility Study and post-closure monitoring results.

9. Source of Comment: Audubon Letter - 8/13/86

Dorothy S. Kaser, Chair

Response From: Robert Leighton, WCC

Comment:

Since the water from the sludge pond is essentially free of contamination, I hope you will make every effort to relocate all aquatic creatures (fish, turtles, eels, etc.) from the sludge pond to the large pond before pumping begins. All aquatic life should be free from any contamination since surface water is free from contamination. Also, pumping and draining will stir sediments on the bottom of the sludge pond.

Response - Robert Leighton, WCC

Every effort will be made to relocate all aquatic life to a suitable environment prior to draining the small (sludge) pond.

10. Source of Comment: Audubon Letter - 8/13/86

Dorothy S. Kaser, Chair

Response From: Robert Leighton, WCC

Comment:

After draining water from the sludge pond, sediments from sludge pond will be exposed and there will be a release of volatile organic compounds into the atmosphere.

Response - Robert Leighton WCC

Two air samples were collected during the site investigation to assess the ambient air quality. These samples were collected upwind of the fill area at the site and were analyzed for particulates, metals, volatile organic compounds, and polychlorinated biphenyls. Levels of particulates and polychlorinated biphenyls were below detectable limits in both samples. The metals constituents of the samples analyzed had insignificant concentrations. The following volatile organic compounds were detected in one of the samples:

Coupound	Concentration (ug/m3)
Xylene	18.6
Tetrachloroethene	6.46
Other hydrocarbons	20.2

These levels are not significant in terms of ambient air quality.

In addition, four air samples were collected during the site investigation to assess the effect of fill area activities including the proposed activities in the small (sludge) pond area on the air quality.

Two samples were collected downwind during the fill area boring activities, at approximately one foot from the ground and 30 feet from the activity. These samples contained no detectable concentrations of

polychlorinated biphenyls or particulates. Metals were detected at or below background levels. The volatile organic compounds present were well below safe ambient levels during the boring activities. One sample was collected directly from a newly excavated surface boring. This sample contained no detectable concentration of polychlorinated biphenyl or particulates. Metals were detected at or below background levels. The volatile organic compounds detected were alkyl benzenes (approximately 1 mg/m^3 and C_8 to C_9 hydrocarbons (approximately 10 mg/m).

One sample was collected in an area where odors were often noted. This sample was collected approximately one foot from the ground. This sample also contained no detectable concentrations of polychlorinated biphenyl or particulates. Metals were detected at or below background levels. The volatile organic compounds detected were xylene (0.017 mg/m^3) and C_8 and C_9 hydrocarbons (0.007 mg/m^3).

These limited data suggest that off-site ambient air quality will not be adversely affected by fill area removal and small pond exposure activities.

For additional information see the Pioneer Sand Remedial Investigation Report, pages 158-162.

11. Source of Comment: Audubon Letter - 8/13/86

Dorothy S. Kaser, Chair

Response From: Robert Leighton, WCC

Comment

Also, environmental effects may occur if significant rainfall should occur and runoff from the area reaches the large pond.

Response - Robert Leighton, WCC

Temporary berms and runoff control dikes will be used during the construction phase of the remedial action in order to minimize any adverse impact to clean areas including the large pond.

12. Source of Comment: Audubon Letter - 8/13/86

Dorothy S. Kaser, Chair

Response From: Robert Leighton, WCC

Comment

That an on-site leachate well located beneath the fill material in a semi-confining bed of the shallow aquifer contains contamination from the source contaminants.

Response - Robert Leighton, WCC

The leachate sample from the monitor well, which is screened below the fill area, contained cadmium, chromium, lead and zinc in concentrations well above Primary Drinking Water Standards. The lead concentration measured is forty times the Drinking Water Standard. Cyanide concentrations in these samples were below the detection limit.

The leachate also contained trace concentrations of phthalates, chlorobenzenes, phenolics and significant concentrations of volatile aromatic hydrocarbons (ethyl benzene, toulene, and xylenes). However, these contaminants are contained by the hydrogeological characteristics of the site and are not migrating off-site.

APPENDIX B

Department Of The Interior
Fish And Wildlife Service
Natural Resource Damage Assessment
Release From Claims

United States Department of the Interior

76

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

MAR 17 1986

ER 84/1508

Mr. Gene Lucero, Director
Office of Waste Programs Enforcement
Environmental Protection Agency
401 M Street, S.W., (Room S364N) WH 527
Washington, D.C. 20460

JUL 7, 1986

Dear Mr. Lucero:

This is a follow-up letter to the one sent to you on May 28, 1985, regarding a preliminary natural resources survey by the Department of the Interior of the Pioneer Sand site, Warrington, Escambia County, Florida.

We have now reviewed the Woodward-Clyde site investigation report on the site that was prepared for the Florida Department of Environmental Regulation. The report was not complete when our earlier letter (attached) was sent to you. The report confirms that the contaminants dumped at this site from 1973 to 1979 have generally remained in place and do not pose an immediate danger away from the disposal area.

We therefore conclude that there are no lands or facilities under the Department of the Interior's trust which have been impacted by contaminants from this site. There is no documentable evidence that migratory birds, anadromous fish, or marine mammals have been impacted, and we do not believe that there have been significant contaminant impacts on endangered or threatened species. We seen no cause of action for, and would be willing to grant a release from, any claims for damages from the Pioneer Sand site, to natural resources under trusteeship of the Secretary of the Interior.

Sincerely

Bruce Blanchard, Director
Office of Environmental Project Review

cc:
Nancy Deck/EPA
cc: Bert Cole, EPA, Atlanta
7/7/86

ERRB RECEIVED JUL 14 1986 EPA - REGION IV ATLANTA, GA.

APPENDIX C

Waste Engineering
Comments To Draft
Record Of Decision

DATE: OCT 07 1986

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

'78

SUBJECT: Review of the Draft Record of Decision
for the Pioneer Sand Site, Pensacola, Florida

FROM: Chief, FL/GA Unit
Waste Engineering Section

TO: Jan Rogers
Remedial Action Section

Douglas C. McCurry, Chief
Waste Engineering Section

The review of the "Draft Record of Decision" for the Pioneer Sand Site has been completed by my staff. The remedial action alternative selected, Alternative Nine, appears to be economically, technologically, and environmentally sound, and appears to be the best of the available alternatives.

A review of the Draft Feasibility Study for the Pioneer Sand Site was forwarded to you on July 24, 1986, (Copy attached). Although no major discrepancies in the site study were detected during that review, the comments or concerns expressed in that memorandum should be addressed as they pertain to the effectiveness of the monitoring and selected remedial action.

Michael J. Hartnett

Michael J. Hartnett

Attachment

cc: Greg Powell

EPA Form 1320-6 (Rev. 3-76)

APPENDIX D

Department of Health And Human Services
Agency For Toxic Substance And Disease Registry
Public Health Evaluation
For
Pioneer Sand Site

DEPARTMENT OF HEALTH & HUMAN SERVICES

80

Public Health Service
Agency for Toxic Substances
and Disease Registry

Memorandum

Date February 10, 1986

From Acting Director
Office of Health Assessment

Subject Remedial Alternatives Pioneer Sand NPL Site
Pensacola, Florida

To Mr. Chuck Pietrosewicz
Public Health Advisor
EPA Region III

EMER. RESP.
RECEIVED
FEB 14 1986
EPA-REGION IV
ATLANTA, GA.

The Environmental Protection Agency (EPA) requested that we review the Feasibility Study to assess the public health adequacy of the public health assessment and screening of remedial alternatives technologies, and also to comment on which of the proposed remedial action alternatives could result in the most effective and efficient protection of public health at the Pioneer Sand Site near Pensacola, Florida.

The Pioneer Sand Site is a former sand borrow pit which operated for several years with a Class III permit for disposal of inert materials. A priority pollutant analysis of soil and water at the site detected significant concentrations of 11 heavy metals and volatile organic compounds. The main source of public health concern is the potential for leachate to contaminate the underlying aquifer, which is the only local source of drinking water for a large number of people in the county.

We concur with the stated conclusions that the remedial alternatives that passed the screening process, or were included to fulfill EPA requirements (4, 6, 9, 10, 11), adequately address public health concerns.

Although no contaminants have been detected moving off-site, despite extensive monitoring of groundwater, the high likelihood that organic solvents may eventually enter the aquifer makes it necessary to reduce the chance that water may enter the fill material from above or below. The recommended alternative, No. 9: fill area and sludge pond waste cover system; leachate collection, treatment and on-site disposal; and surface water treatment and on-site discharge, appears to be the most effective and efficient remedial procedure to reduce the potential public health threat.

We hope this information is useful to you.

Stephen Margolis, Ph.D

DEPARTMENT OF HEALTH & HUMAN SERVICES

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Public Health Service
Agency for Toxic Substances
and Disease Registry

Memorandum

Date .September 18, 1986

From Public Health Advisor
ATSDR-EPA Liaison

Subject Pioneer Sand NPL Site;
Pensacola, Florida

To Greg Powell, EPA ERRB
Remedial Program Manager

As requested, I have reviewed the draft Record Of Decision, dated September 10, 1986, for the above NPL site.

I have no comments to offer with regard to your four (4) selected remedies for this site. While the public health threat posed by this site is minimal, the implementation of these remedies will more than adequately address any current or future public health concerns.

We appreciate the opportunity to have worked with you through out the remedial process for this NPL site. If I can be of further assistance, please let me know.

Chuck Pietrosewicz

cc: file
ATSDR/Buynoski

Memorandum

Date JUL 23 1986

From Acting Director
Office of Health Assessment

Subject Additional Soil Samples; Pioneer Sand NPL Site
Pensacola, Florida, SI-86-177

To Mr. Chuck Pietrosewicz
Public Health Advisor
EPA Region III

EXECUTIVE SUMMARY

The Environmental Protection Agency (EPA) requested that the Agency for Toxic Substances and Disease Registry (ATSDR) review additional soil samples from the Pioneer Sand Site. Although PCBs were found on-site in soil samples, the highest levels found were below the range where substantial human uptake has been reported. PCBs were not detected in the aquifer or in leachate, so there is little likelihood that PCBs will migrate off-site. The on-site health risk from PCBs will be quite small following the proposed remedial actions, and the health risk off-site from PCBs is insignificant.

For these reasons, we do not wish to alter our previous conclusions and recommendations (February 10, 1986, letter).

MATERIAL REVIEWED

Memo from EPA Region IV, Remedial Project Manager, to Chuck Pietrosewicz, ATSDR Liason. Review of additional PCB soil data from the Pioneer Sand NPL site. Includes data package dated July 9, 1986.

Letter from Woodward-Clyde (Tallahassee) to Ron Leins, Florida Department of Environmental Regulation; copy to EPA Region IV, Emergency Response Branch. Results of reanalysis of soil PCB samples dated June 26, 1986.

BACKGROUND

We previously reviewed the feasibility study. The Pioneer Sand Site is a former sand borrow pit which is used illegally for disposal of hazardous wastes and materials. Significant concentrations of 11 heavy metals and volatile organic compounds were detected in soil and water on-site. The main public health concern is potential contamination of the under- lying aquifer.

DISCUSSION

Soil samples taken on-site show detectable levels of PCB for five compounds: Araclor 1242, 1248, 1254, 1260, and 1268. The four highest PCB levels were 9, 43, 58, and 69 ppm.

PCB contamination appears to be limited to soil in the fill area on the site. PCBs adhere tightly to soils and therefore migrate slowly. They have very low solubility in water, and none have been detected in water samples on-site or off-site. These observed levels are not alarmingly high in any case. ATSDR's current policy is that PCBs in residential soil levels up to about 100 ppm do not constitute a significant health risk under usual conditions.

CONCLUSIONS

Although PCBs were found on-site in soil samples, the highest levels found were below the range where substantial human uptake has been reported. PCBs were not found in the aquifer or in leachate, so there is little likelihood that PCBs will migrate off-site. The on-site health risk will be quite small following the proposed remedial actions, and the health risk off-site is insignificant.

for Jeffrey A. Lybarger, M.D.

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APPENDIX E

State OF Florida
Department of Environmental Regulation
Letter Of Concurrance
For The
Selected Remedy

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301-8241

BOB GRAHAM
GOVERNOR

VICTORIA J. TSCHINKEL
SECRETARY

September 24, 1986

Mr. Jack Ravan
Regional Administrator
United States Environmental
Protection Agency
Region IV
345 Courtland Street, N.E.
Atlanta, Georgia

Dear Jack:

The Florida Department of Environmental Regulation agrees with and commits to remedial alternative number nine recommended in the final feasibility study for the Pioneer Sand Superfund Site in Escambia County, Florida.

This alternative includes a cover system for the fill area and sludge pond area; leachate collection, treatment and on-site disposal; surface water treatment with on-site discharge; and long term monitoring. The alternative alleviates all existing and potential health effects, presents no new public health hazards and substantially reduces the threat to the surface and groundwater.

The present worth cost estimate for the selected alternative is $462,000 for capital construction costs, and $47,000 for the first year operation and maintenance. The state will provide 10 percent of the capital, treatment and disposal costs, or about $50,900, through the State Water Quality Assurance Trust Fund. We are also committed to monitoring and maintenance of the site beginning one year after construction is complete.

We look forward to participating with the U. S. Environmental Protection Agency in the successful implementation of this project.

Sincerely,

Victoria J. Tschinkel
Secretary

VJT/ps

TABLE 9: ALTERNATIVE SCREENING AND EVALUATION SUMMARY

ALTERNATIVE	DESCRIPTION	TYPE OF EVALUATION						REMAINING ALTERNATIVES AFTER SCREENING AND EVALUATION	EPA CATEGORY
		INITIAL SCREENING	TECHNICAL FEASIBILITY	PUBLIC HEALTH	INSTITUTIONAL	ENVIRONMENTAL	COST		
1	No action.	1	1						
2	No action with monitoring.	2	2	(2)*				2	E
3	Fill Area Cover System	3	3						
4	Fill Area Cover System; Leachate Collection, Temporary Storage, and Offsite Disposal.	4	4	(4)*				4	A, D
5	Fill Area Cover System; Leachate Collection, Temporary Storage, and Offsite Disposal; Surface Water Treatment and Onsite Discharge	5	5						
6	Fill Area CoverSystem; Leachate Collection, Temporary Storage, and Offsite Disposal; Surface Water Treatment and Onsite Discharge; Cover System for Sludge Pond Waste	6	6	6	6	6	6	6	A, B
7	Fill Area Cover System; Leachate Collection, Temporary Storage, and Offsite Disposal; Surface Water Treatment and Onsite Discharge; Offsite Disposal of Sludge Pond Waste	7	7	7	7	7			
8	Fill Area Cover System; Leachate Collection, Temporary Storage, and Offsite Disposal; Surface Water Treatment and Onsite Discharge; Onsite Disposal of Sludge Pond Waste	8	8	8	(8)**				
9	Fill Area Cover System; Leachate Collection, Treatment, and Onsite Disposal; Surface Water Treatment and Onsite Discharge; Cover System for Sludge Pond Waste	9	9	9	9	9	9	9	B
10	Fill Area Cover System; Leachate Collection, Treatment, and Onsite Disposal; Surface Water Treatment and Onsite Discharge; Offsite Disposal of Sludge Pond Waste	10	10	10	10	10	(10)*	10	A, C
11	Fill Area Cover System; Leachate Collection, Treatment, and Onsite Disposal; Surface Water Treatment and Onsite Discharge; Onsite Disposal of Sludge Pond Waste	11	11	11	(11)*			11	C
12	Fill Area Cover System; In Situ Leachate Treatment; Surface Water Treatment and Onsite Discharge; Cover System for Sludge Pond Waste	12							
13	Fill Area Cover System; In Situ Leachate Treatment; Surface Water Treatment and Onsite Discharge; Offsite Disposal of Sludge Pond Waste	13							
14	Fill Area Cover System; In Situ Leachate Treatment; Surface Water Treatment and Onsite Discharge; Onsite Disposal of Sludge Pond Waste	14							
15	Offsite Disposal of Fill Area Waste; Leachate Collection, Temporary Storage, and Offsite Disposal; Surface Water Treatment and Onsite Discharge; Offsite Disposal of Sludge Pond Waste								

()* - Eliminated alternative, but carried through to final, based on EPA category designation.

()**- Only carried to cost evaluation, where eliminated.

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TABLE 8: SUMMARY OF THE ENVIRONMENTAL EVALUATION OF REMEDIAL ALTERNATIVES

ALTERNATIVE	BENEFICIAL EFFECTS: NO-ACTION ENVIRONMENTAL CONDITIONS	BENEFICIAL EFFECTS: IMPROVEMENTS IN BIOLOGICAL ENVIRONMENT	BENEFICIAL EFFECTS: IMPROVEMENTS IN HUMAN RESOURCE	ADVERSE EFFECTS: CONSTRUCTION/IMPLEMENTATION	ADVERSE EFFECTS: MITIGATIVE MEASURES
1	•Continued infiltration through waste creating leachate. •Continued contamination surface runoff into the sludge pond area. •Direct contact with contaminated material by intruders. •Potential groundwater contamination. •Potential contamination of large pond. •No knowledge of problems spread beyond site boundaries.	None	None	None	None
2	•Continued infiltration through waste creating leachate. •Continued contamination surface runoff into the sludge pond area. •Direct contact with contaminated material by intruders. •Potential groundwater contamination. •Potential contamination of large pond. •Awareness of groundwater contamination spread beyond site boundaries.	None	None	None	None
3	•Infiltration through fill area reduced or eliminated. •Direct contact with contaminated material by intruders eliminated for fill area and reduced for sludge pond area. •Reduction of contaminated surface runoff into sludge pond area. •Reduction of potential for groundwater contamination. •Awareness of groundwater contamination spread beyond site boundaries.	•Threat to large pond reduced. •Threat to groundwater reduced. •Intrude direct contact potential reduced.	•Improved site appearance.	Short term effects: •Release of low concentration of volatile organics expected in excavating for the cover system. •Dust generation. •Community disturbance from heavy equipment.	•Personnel protective equipment onsite. •Dust suppression techniques. •Control of onsite working hours. •Collect and treat contaminated runoff prior to discharge. •Run-off control berm. •Monitor onsite volatile organic concentrations. •Run on exclusion berm.
4	•Infiltration through fill area reduced or eliminated. •Direct contact with contaminated fill by intruders eliminated and reduced for sludge pond area. •Reduction of contaminated surface runoff into sludge pond area. •Potential for groundwater contamination reduced or eliminated. •Awareness of groundwater contamination spread beyond site boundaries.	•Threat to large pond reduced. •Threat to groundwater reduced or eliminated. •Intruder direct contact potential reduced.	•Improved site appearance. •Protection of groundwater resource.	Short term effects: •Release of low concentrations of volatile organics expected in excavating. •Dust generation. •Community disturbance from heavy equipment. •Potential increase of surface runoff contamination during excavation. Long term effects: •Periodic shipment of leachate by tank truck. •Periodic maintenance activities.	

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TABLE 3

ALTERNATIVE	BENEFICIAL EFFECTS			ADVERSE EFFECTS	
	FINAL ENVIRONMENTAL CONDITIONS	IMPROVEMENTS IN BIOLOGICAL ENVIRONMENT	IMPROVEMENTS IN HUMAN RESOURCE	CONSTRUCTION/OPERATION	MITIGATIVE MEASURES
5	•Infiltration through fill area reduced or eliminated. •Direct contact with contaminated material by intruders eliminated for fill area and reduced for sludge pond area. •Elimination of sludge pond. •Reduction of potential for groundwater contamination. •Awareness of groundwater contamination spread beyond site boundaries.	•Threat to large pond reduced. •Threat to groundwater reduced or eliminated. •Intruder direct contact potential reduced. •Elimination of sludge pond prevents ingestion of contaminated water by local fauna.	•Improved site appearance. •Protection of groundwater resource.	Short term effects: •Release of low concentrations of volatile organics expected in excavating. •Dust generation. •Community disturbance from heavy equipment. •Potential increase of surface runoff contamination during excavation. Long term effects: •Periodic shipment of leachate by tank truck. •Periodic maintenance activities.	•Personnel protective equipment onsite. •Dust suppression techniques. •Control of onsite working hours. •Collect and treat contaminated runoff prior to discharge. •Runoff control berm. •Monitor onsite volatile organic concentrations. •Run on exclusion berm.
6	•Infiltration reduced or eliminated. •Direct contact with contaminated materials eliminated. •Elimination of sludge pond. •Potential for groundwater contamination reduced or eliminated. •Awareness of groundwater contamination spread beyond boundaries.	•Elimination of threat to large pond. •Threat to groundwater reduced or eliminated. •Intruder direct contact eliminated. •Elimination of sludge pond prevents ingestion of contaminated water by local fauna.	•Clean site appearance. •Protection of groundwater resource. •Protection of community health.	Short term effects: •Release of low concentrations of volatile organics expected in excavating. •Dust generation. •Community disturbance from heavy equipment. •Potential increase of surface runoff contamination during excavation. Long term effects: •Periodic shipment of leachate by tank truck. •Periodic maintenance activities.	•Personnel protective equipment onsite. •Dust suppression techniques. •Control of onsite working hours. •Collect and treat contaminated runoff prior to discharge. •Runoff control berm. •Monitor onsite volatile organic concentrations. •Run on exclusion berm.
7	•Infiltration reduced or eliminated. •Direct contact with contaminated materials eliminated. •Elimination of contamination to sludge pond area. •Potential for groundwater contamination reduced or eliminated. •Awareness of groundwater contamination spread beyond boundaries.	•Elimination of threat to large pond. •Threat to groundwater reduced or eliminated. •Intruder direct contact eliminated. •Elimination of sludge pond prevents ingestion of contaminated water by local fauna.	•Clean site appearance. •Protection of groundwater resource. •Protection of community health.	Short term effects: •Release of low concentrations of volatile organics expected in excavating. •Dust generation. •Community disturbance from heavy equipment. •Potential increase of surface runoff contamination during excavation. •Potential for offsite spills due to hauling to landfill. •Increased heavy equipment activity to excavate sludge pond area. Long term effects: •Periodic shipment of leachate by tank truck. •Periodic maintenance activities.	•Personnel protective equipment onsite. •Dust suppression techniques. •Control of onsite working hours. •Collect and treat contaminated runoff prior to discharge. •Runoff control berm. •Monitor onsite volatile organic concentrations. •Run on exclusion berm.

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TABLE 9

ALTERNATIVE	BENEFICIAL EFFECTS			ADVERSE EFFECTS	
	FIRST ENVIRONMENTAL CONDITIONS	IMPROVEMENTS IN BIOLOGICAL ENVIRONMENT	IMPROVEMENTS IN HUMAN RESOURCE	CONSTRUCTION/OPERATION	MITIGATIVE MEASURES
8	•Infiltration reduced or eliminated. •Direct contact with contaminated materials eliminated. •Elimination of contamination in sludge pond area. •Potential for groundwater contamination reduced or eliminated. •Awareness of groundwater contamination spread beyond boundaries. •Construction of an onsite landfill cell.	•Elimination of threat to large pond. •Threat to groundwater reduced or eliminated. •Intruder direct contact eliminated. •Elimination of sludge pond prevents ingestion of contaminated water by local fauna.	•Clean site appearance. •Protection of groundwater resource. •Protection of community health.	Short term effects: •Release of low concentrations of volatile organics expected in excavation. •Dust generation. •Community disturbance from heavy equipment. •Potential increase of surface runoff contamination during excavation. •Increased heavy equipment use to construct onsite landfill and excavate sludge pond area. •Expected to take 1 year to build Long term effects: •Periodic shipment of leachate by tank truck. •Periodic maintenance activities.	•Personnel protective equipment onsite. •Dust suppression techniques. •Control of onsite working hours. •Collect and treat contaminated runoff prior to discharge. •Runoff control berm. •Monitor onsite volatile organic concentrations. •Run on exclusion berm.
9	•Infiltration reduced or eliminated. •Direct contact with contaminated materials eliminated. •Elimination of contamination in sludge pond area. •Potential for groundwater contamination reduced or eliminated. •Awareness of groundwater contamination spread beyond boundaries. •Leachate treated onsite and discharged to the large pond.	•Elimination of threat to large pond. •Threat to groundwater reduced or eliminated. •Intruder direct contact eliminated. •Elimination of sludge pond prevents ingestion of contaminated water by local fauna.	•Clean site appearance. •Protection of groundwater resource. •Protection of community health.	Short term effects: •Release of low concentrations of volatile organics expected in excavation. •Dust generation. •Community disturbance from heavy equipment. •Potential increase of surface runoff contamination during excavation. Long term effects: •Release of volatile organic emissions from leachate treatment system may cause odors near the treatment unit. Expected to decline as leachate flow goes to zero.	•Personnel protective equipment onsite. •Dust suppression techniques. •Control of onsite working hours. •Collect and treat contaminated runoff prior to discharge. •Runoff control berm. •Monitor onsite volatile organic concentrations. •Run on exclusion berm.

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TABLE 3

ALTERNATIVE	BENEFICIAL EFFECTS: FINAL ENVIRONMENTAL CONDITIONS	BENEFICIAL EFFECTS: IMPROVEMENTS IN BIOLOGICAL ENVIRONMENT	BENEFICIAL EFFECTS: IMPROVEMENTS IN HUMAN RESOURCE	ADVERSE EFFECTS: CONSTRUCTION/OPERATION	ADVERSE EFFECTS: MITIGATIVE MEASURES
10	•Infiltration reduced or eliminated. •Direct contact with contaminated materials eliminated. •Elimination of contamination in sludge pond area. •Potential for groundwater contamination reduced or eliminated. •Awareness of groundwater contamination spread beyond boundaries. •Leachate treated onsite and discharged to the large pond.	•Elimination of threat to large pond. •Threat to groundwater reduced or eliminated. •Intruder direct contact eliminated. •Elimination of sludge pond prevents ingestion of contaminated water by local fauna.	•Clean site appearance. •Protection of groundwater resource. •Protection of community health.	Short term effects: •Release of low concentrations of volatile organics expected in excavating •Dust generation. •Community disturbance from heavy equipment./ •Potential increase of surface runoff contamination during excavation. •Potential for offsite spills due to hauling to landfill. •Increased heavy equipment activity to excavate sludge pond area. Long term effects: •Release of volatile organic emissions from leachate treatment system may cause odors near the treatment unit. Expected to decline as leachate flow goes to zero.	•Personnel protective equipment onsite. •Dust suppression techniques. •Control of onsite working hours. •Collect and treat contaminated runoff prior to discharge. •Runoff control berm. •Monitor onsite volatile organic concentrations. •Run on exclusion berm
11	•Infiltration reduced or eliminated. •Direct contact with contaminated materials eliminated. •Elimination of contamination in sludge pond area •Potential for groundwater contamination reduced or eliminated. •Awareness of groundwater contamination spread beyond boundaries. •Construction of an onsite landfill. •Leachate treated onsite and discharged to the large pond.	•Elimination of threat to large pond. •Threat to groundwater reduced or eliminated. •Intruder direct contact eliminated. •Elimination of sludge pond prevents ingestion of contaminated water by local fauna.	•Clean site appearance. •Protection of groundwater resource. •Protection of community health.	Short term effects: •Release of low concentrations of volatile organics expected in excavating •Dust generation. •Community disturbance from heavy equipment. •Potential increase of surface runoff contamination during excavation. •Increased heavy equipment use to construct onsite landfill and excavate sludge pond area. •Expected to take 1 year to build. Long term effects: •Release of volatile organic emissions from leachate treatment system may cause odors near the treatment unit. Expected to decline as leachate flow goes to zero.	•Personnel protective equipment onsite. •Dust suppression techniques. •Control of onsite working hours. •Collect and treat contaminated runoff prior to discharge. •Runoff control berm. •Monitor onsite volatile organic concentrations. •Run on exclusion berm.

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TABLE 7: SUMMARY OF TECHNICAL FEASIBILITY

		PERFORMANCE		RELIABILITY		IMPLEMENTABILITY		TIME		SAFETY	
ALTERNATIVE	REMEDIAL ACTION	EFFECTIVENESS	USEFUL LIFE	O&M REQUIREMENTS	POSSIBLE FAILURE MODE	SITE CONDITION	SPECIAL CONDITIONS REQUIRED	IMPLEMENTATION	RECEIVE	SAFETY HAZARDS & SAFETY	ENVIRONMENTAL
1	No Action	Does not contain, remove, or treat waste.	Not applicable.	Extremely low, periodic site inspection.	Fence does not provide adequate barrier against site entry and exposure.	Some site clearing required to build fence.		1 month		May require respiratory protection (fence will be constructed in "clean area").	Long term potential for contamination or exposure still exists.
2	No Action With Monitoring	Does not contain, remove, or treat waste.	Not applicable.	Governmental unit must accept responsibility for monitoring. Periodically clean monitoring well.	No technology. Standard laboratory procedures.	Protect against tampering.		1 month monitoring program. Sample collection: 1st year - quarterly 2nd year on-semi annually		Respiratory protector may be required.	
3	Fill Area Cover System	Contains fill material waste; cover system limits exposure of fill material waste and reduces infiltration thereby retarding or eliminating infiltration. Efficiency is estimated to be greater than 80%.	Cover system will have an estimated useful life of > 30 years if properly designed and maintained.	O&M requirements low. No complex maintenance is required. Materials and labor available locally: (1) mowing; and (2) repair of cover due. Settlement and erosion.	Inadequate design of the slope and drainage system will increase erosion of the cover and cause infiltration. May be required to excavate construction debris.	After grading the site for the proper slope, an additional layer of material may be required before placement of clay layer. Installation of cover will require approximately 25% longer due to safety requirements. Excavation of fill area may require substantially longer time due to obstructions.	Remedial actions are exempt from RCRA regulations and therefore do not require permits. Notification of activity to the appropriate authority is desirable.	3 5 months	1 2 months after completion of the cover.	Level B protection will be required during the excavation phase.	Sludges in pond area still exposed.

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TABLE 7

Alternative	Remedial Action	Performance: Effectiveness	Performance: Useful Life	Reliability: O&M Requirements	Reliability: Possible Failure Mode	Implementability: Site Condition	Implementability: Conditions External	Time: Implement	Time: Achieve	Safety: Impact during Implementation & Safety	Safety: Long-term
4	FABE Materials Cover System	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	Sludge, in pond area still exposed.
	LFS, Offsite Disposal	Leachate is collected and transported to an offsite deep well injection facility. Performance of deep well injection is high.	Mechanical components may require repair after 5-10 years and possible replacement after 20 years.	O&M Requirements - Moderate. Routine maintenance on storage tank, transfer line and pump.	Storage tank leakage. Construct dikes around storage facility. LFS may become clogged. Leaks from leachate transfer line. Pump failure.	LFS may require construction below water table to provide adequate collection. 30-50% increase in time required to complete task due to safety requirements and construction techniques.	May require compliance with federal and State regulations for the transport of hazardous waste.	Leachate collection system must be installed first.	Results should be realized 1-2 months.	None.	
5	Cover System	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3
	Collection, Temporary Storage, Off-Site Disposal	See Alternative 4	See Alternative 4	See Alternative 4	See Alternative 4	See Alternative 4	See Alternative 4	See Alternative 4	See Alternative 4	See Alternative 4	See Alternative 4
	On-Site Treatment, Discharge to Large Pond	Substantially reduce or completely eliminate particulate load to large pond. Effective > 90% in reducing particulate load.	Temporary until, treatment package 0-8 days.	Backflushing may be required, monitored to control particulate intake.	Treatment efficiency will be substantially reduced if design loads are exceeded.	Treatment efficiency and time required to complete task is directly related to weather.	None	0-8 days.	When sludge pond is pumped dry.	Work within the immediate sludge pond area requires level B respiratory protection.	None. Low metals concentrations removed before discharge to large pond.

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ALTERNATIVE	REMEDIAL ACTION	PERFORMANCE		RELIABILITY		IMPLEMENTABILITY					COST
		EFFECTIVENESS	USEFUL LIFE	O&M REQUIREMENTS	POSSIBLE FAILURE MODE	SITE CONDITIONS	CONSTRUCTION CONDITIONS	TIME IMPLEMENT	TIME START	TIME COMPLETE & SAFETY	CAPITAL
6	Cover System	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3
	Collection, temporary storage, and Offsite Deep Well Injection	See Alternative 4	See Alternative 4	See Alternative 4	See Alternative 4	See Alternative 4	See Alternative 4	See Alternative 4	See Alternative 4	See Alternative 4	See Alternative 4
	On site treatment and Discharge to Large Pond	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5
	ESII and Cover System	SOME Effective in limiting human contact.	Indefinite if properly maintained	See Alternative 3	If leachate collection system fails pressure build-up may occur resulting in purging of leachate	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3
7	Cover System	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3
	Collection, Temporary Storage, Disposal Off-site	See Alternative 4	See Alternative 4	See Alternative 4	See Alternative 4	See Alternative 4	See Alternative 4	See Alternative 4	See Alternative 4	See Alternative 4	See Alternative 4
	On site treatment, Discharge to Large Pond	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5
	Disposal at Off-site RCRA	SOME Effective in removal of sludge material to RCRA landfill	Not Applicable	None (OEM Responsibility of HWM)	Possibility of component failure is substantially less at a controlled hazardous landfill than onsite landfill due to rigorous maintenance and inspections by federal, state and plant personnel.	Volume reduction by filtration must be determined by dewatering test	Must comply with federal and state regulations for the transport of hazardous waste	3 weeks	Results achieved at completion of task.	Level B protection required in the excavation and dewatering area.	

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ALTERNATIVE	REMEDIAL ACTION	PERFORMANCE		RELIABILITY		CONSTRUCTABILITY		TIME		SAFETY	
		EFFECTIVENESS	USEFUL LIFE	O&M REQUIREMENTS	POSSIBLE FAILURE MODE	SITE CONDITIONS	CONDITIONS EXISTING	IMPLEMENT	ACHIEVE	ADVERSE EFFECTS & SAFETY	IMPLEMENTABILITY
8	Cover System	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	
	Leachate Collection, Temporary Storage, Off site Disposal	See Alternative 4	See Alternative 4	See Alternative 4	See Alternative 4	See Alternative 4	See Alternative 4	See Alternative 4	See Alternative 4	See Alternative 4	
	On site Treatment and Discharge to Large Pond	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5
	Sludge Removal, Disposal to On site Landfill	100% Effective on site landfill constructed according to RCRA requirements.	State of the art in landfill design. Anticipated design life > 30 years.	Slope maintenance and repair. Rigorous inspection and monitoring.	Since the sludge is solidified before placing in landfill, component failure is low.	Complicated drainage system, placement of liners requires specially trained personnel.	Compliance with RCRA requirements.	Construction of landfill will require 1 year.	Results achieved upon cell closure.	Level B protection will be required.	
9	Cover System	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	
	LFS, On site treatment	Modified trickling filter. Aeration - volatilizes organics. Physical treatment - limestone raises pH resulting in metal precipitation. Conventional treatment in Gulf. Performance well demonstrated.	Useful life is a function of loading and operating time.	Routine maintenance and sampling.	Increases in design loading may short circuit the treatment process.	See Alternative 4		4 months	1-2 years after completion of cover.		
	On site Treatment and Discharge to Large Pond	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5
	Fill and Cover System	See Alternative 6	See Alternative 6	See Alternative 6	See Alternative 6	See Alternative 6	See Alternative 6	See Alternative 6	See Alternative 6	See Alternative 6	

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TABLE 7

ALTERNATIVE	REMEDIAL ACTION	PERFORMANCE		RELIABILITY		IMPLEMENTABILITY		TIME		COST	
		EFFECTIVENESS	USEFUL LIFE	O&M REQUIREMENTS	POSSIBLE FAILURE MODE	SITE CONDITION	COMMITMENTS OF OTHERS	IMPLEMENT	ACHIEVE	CAPITAL COSTS & COSTS	COMMENTS
10	Cover System	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	
	ECS, Treatment, Disposal On Site	See Alternative 9	See Alternative 9	See Alternative 9	See Alternative 9	See Alternative 9	See Alternative 9	See Alternative 9	See Alternative 9	See Alternative 9	
	On Site treatment, Discharge to Large Pond	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5
	Remove, Dispose Off Site	See Alternative 7	See Alternative 7	See Alternative 7	See Alternative 7	See Alternative 7	See Alternative 7	See Alternative 7	See Alternative 7	See Alternative 7	
11	Cover System	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	
	ECS, Disposal On Site	See Alternative 9	See Alternative 9	See Alternative 9	See Alternative 9	See Alternative 9	See Alternative 9	See Alternative 9	See Alternative 9	See Alternative 9	
	On-Site treatment, Discharge	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5
	Remove, Dispose On-Site	See Alternative 8	See Alternative 8	See Alternative 8	See Alternative 8	See Alternative 8	See Alternative 8	See Alternative 8	See Alternative 8	See Alternative 8	
12	Cover System	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	
	In Situ Treatment	Can treat organics or metals, but not both. No driving force.	Can not be determined. GAC absorbes all priority pollutants and organics.	High removal and regeneration cost. No mechanism to determine when exhaustion occurs.	Exhaustion of permeable treatment bed would result in no treatment. Lack of discharge could result in hydrostatic build up and force contamination out of confined area. If system fails may provide driving force for off-site migration of contaminants.			1 month	No way to determine if in situ treatment is working	Level B required within construction activity area.	
	On Site treatment, Discharge to Large Pond	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	
	FETI and Cover System	See Alternative 6	See Alternative 6	See Alternative 6	See Alternative 6	See Alternative 6	See Alternative 6	See Alternative 6	See Alternative 6	See Alternative 6	

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ALTERNATIVE	REMEDIAL ACTION	PERFORMANCE		RELIABILITY		UNCERTAINTIES		TIME		SAFETY	
		EFFECTIVENESS	USEFUL LIFE	O&M REQUIREMENTS	POSSIBLE FAILURE MODE	SITE CONDITIONS	EXTERNAL CONDITIONS	IMPLEMENT	ACHIEVE	ENVIRONMENT & WORKER	COMMUNITY
13	Cover System	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	
	In Situ Treatment	See Alternative 12	See Alternative 12	See Alternative 12	See Alternative 12	See Alternative 12	See Alternative 12	See Alternative 12	See Alternative 12	See Alternative 12	
	On Site Treatment, Discharge	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5
	Remove, Disposal Off Site	See Alternative 7	See Alternative 7	See Alternative 7	See Alternative 7	See Alternative 7	See Alternative 7	See Alternative 7	See Alternative 7	See Alternative 7	
14	Cover System	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	See Alternative 3	
	In Situ Treatment	See Alternative 12	See Alternative 12	See Alternative 12	See Alternative 12	See Alternative 12	See Alternative 12	See Alternative 12	See Alternative 12	See Alternative 12	
	On Site Treatment, Discharge	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5	See Alternative 5
	Remove, Disposal Off Site	See Alternative 8	See Alternative 8	See Alternative 8	See Alternative 8	See Alternative 8	See Alternative 8	See Alternative 8	See Alternative 8	See Alternative 8	

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